FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1931

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Aug. 29. Gliding Meeting at Portsdown Hill.
Aug. 29-Sept. 5. Boulogne Air Week.
Aug. 29-Sept 7. U.S. National Air Races, Cleveland, Ohio.
Sept. 2. Exhibition of Aerodrome Lighting at Croydon Aerodrome.
Sept. 5. Norfolk and Norwich Ae.C. Display at Yarmouth.
Sept 5. Haldon Flying Meeting.
Sept. 6. Air Pageant, Sherburn-in-Elmet, Leeds.
Sept. 12. Schneider Trophy Contest.
Sept. 16. "Development of Aircraft Manufacturing," Wilbur Wright Memorial Lecture, by Glenn L. Martin, before R.Ae.S.
Sept. 19. All-Women's Aviation Meeting at Northamptonshire Ae.C., Sywell.
Sept. 23-Oct. 11. French Two-Seater Light 'Plane Competition.
Sept. 26. Garden Party, Bristol and Wessex Ae.C.
Oct. 3. Cardiff Ae.C. Air Pageant at Splott Aerodrome.
Oct. 4-5. International Gliding Competition, Balsdean, Sussex.
Oct. 8. Balloon Ascent, Lecture by Prof. Piccard before R.Ae.S.
Oct. 15. "Protection of Metals in Aircraft Construction," Lecture by H. Sutton before R.Ae.S.
Oct. 29. "Accidents in Civil Aviation," Lecture by Capt. A. G. Lamplugh before R.Ae.S.
Nov. 5. "Safety in Spinning," Lecture by H. B. Irving before R.Ae.S.
Nov. 19. "Aircraft Vibration," Lecture by H. Constant before R.Ae.S.
Dec. 3. "Wheel Brakes and Undercarriages," Lecture by S. Scott Hall before R.Ae.S.
Dec. 10. "Air Flow—Demonstrations on the Screen by Means of Smoke," Lecture by W. S. Farren before R.Ae.S.
Dec. 17. "Control Beyond the Stall," Lecture by Dr. G. V. Lachmann before R.Ae.S.

EDITORIAL COMMENT

IT seems that Great Britain is not the only country which is suffering from bad weather. When our skies weep, and the chilly August wind cuts through our flannel suits, we sigh for Italian skies. On Lake Garda, we feel sure, the sun ever shines, and the soft zephyrs gently stir the surface of the waters, cooling the brow of man and guiding the Schneider pilot as he lands his seaplane. The French pilots, too, are surely fortunate men, living on a lake just off the Côte d'Azur. How blessed their lot compared with that of Great Britain's champions, who have to be content with the same waters which wash the Côte d'Argent, the "Silver Sea," as Shakespeare had it. Silver is but a chilly metal. On the stormy Solent we are accustomed to see flying held up for days at a time, especially at a period when we particularly need every possible flying hour.

Still Uncertain

It seems, however, that Lake Garda is not always the sea of delight which fancy pictures it. The Italian Schneider team is sometimes kept ashore when its need for practice is even greater than ours. It was first announced that an official decision would be made on August 20 as to whether the Italian High Speed Flight had made sufficient progress to be able to follow up its challenge in the Schneider contest. Weather, it was stated, held up the practice, and made a decision on that date impossible. Then, General Balbo was to go to Desenzano on the 23rd inst. to witness trial flights with the new racing seaplanes and make the announcement which is so eagerly awaited in Italy, in Great Britain, in France, and, in fact, throughout the world. Again bad weather is stated to have intervened, and the necessary preliminary tests have not yet been carried out. We are still left in suspense as to whether Italy will be able to bring a team to the Solent by September 12. The suspense is very trying to all of us, and it must be especially harrowing to our pilots. The Italian team must feel the strain even more acutely. Now the great Italian air manœuvres are

about to start, and General Balbo has two important matters to occupy his attention. It is thought that he cannot possibly give his full attention to both at the same time. It is all very unfortunate, and nothing can be done but to execrate the weather on Lake Garda, which we are usually inclined to envy.

France is equally uncertain as a starter. A very little more news, or what purports to be news, has appeared in the Press about the French machines than has been allowed to appear about the mysterious Italian seaplanes. The first string is stated to be a Bernard with a very powerful Hispano engine—it is of no value to mention the horse-power of any engine before the race, as this is always kept secret—and a Nieuport with a similar engine. The difficulty with France appears to be finding pilots. Though the team which went into training at Etang de Berre consisted of service pilots, presumably from the Naval Air Service, the French Press persists in suggesting the names of civilians as likely to fly the machines, and especially clings to the idea that the veteran Sadi Lecointe will pilot one of them. This is so improbable that we can only conclude that the French daily Press is not well informed on racing seaplane subjects, and disinclines us to pay much attention to any of the rumours which it publishes.

It almost goes without saying that British weather has seriously interfered with the practice of our team. Despite the tragic loss of Brinton, we are not short of pilots, but we are short of racing seaplanes. At the moment the only two modern machines at Calshot are the two S.6 "B" seaplanes, and so far none of our pilots has had very much practice on them. Every effort is being made to hasten the repair of the S.6. "A" which was damaged in Hope's crash, and we trust that it will soon be ready for the air again. We need three machines for the contest, and even counting this "A" machine we have no reserve in the case of further mishaps. The Gloster 6 machines are at Calshot, but we gather that the old trouble about the petrol feed has not been entirely overcome, and we could not enter either of these seaplanes for the contest with confidence that it would finish the course. It would seem absurd to have to fall back on an S.5, a machine which raced at Venice in 1927. We used one of them in 1929, but two years have passed since then. The bravest seaplane must some day come to the end of its racing life.

When all is said and done, the position is not so parlous now as it was at a later date than this two years ago. The weather may improve both at Lake Garda and at the Solent, and give the Italian and British pilots sufficient opportunity for practice. The French problems may prove to be less than they are made out to be. We have reached the period of training and preparation which corresponds to the period in a cricket innings which Mr. Jack Hobbs describes as "the nervy nineties." Everything seems particularly difficult, and each pessimistic rumour is magnified by our tense nerves into a mountain of disaster. We have still a better prospect of a good race than we had on August 28, 1929.

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Flight is a non-political paper, and the only interest which political crises and changes has for us is the question of appointing a good man as Secretary of State for Air, and another good man as Under-Secretary. Of course, the balancing of the Budget has an interest for every taxpayer and for every good citizen, every one of whom has a private budget to balance and finds the task either easier or more difficult according to the behaviour of the Government in power. We therefore wish all success to the new Cabinet just formed by Mr. MacDonald.

India's Good Fortune

In the list of new Ministers, published as we go to press, we are glad to see that Lord Amulree remains undisturbed at the Air Ministry, though the heads of the Navy, Army and Air Force have no longer got places in the Cabinet. Spending departments are evidently suspect to an economy Cabinet. At the moment we do not know who is to be the Under-Secretary for Air. Presumably we shall have to say good-bye to Mr. Montague; and, if that is so, we shall do so with unfeigned regret. He has been an enthusiastic traveller by air, and when we have had personal relations with him, his genial courtesy has left pleasant recollections.

The most interesting of the new appointments, in our eyes, is that of Sir Samuel Hoare to the India Office. Sir Samuel Hoare has twice been Air Minister, and there has never been a better one. He threw himself so wholeheartedly into his work that he was once accused of having been "bitten by a mad aeroplane." He was the first Air Minister to lay down definite policies for the Royal Air Force in peace and for Civil Aviation. His ability was obvious to all who studied his work. It receives a full recognition in his selection as one of the ten members of the new Cabinet.

Next to the posts of Prime Minister and Chancellor of the Exchequer, the appointment of Secretary of State for India is perhaps the most important in the Cabinet. It has not a direct bearing on economy, which makes the inclusion of the Secretary for India in the new Cabinet all the more significant. The settlement of the Indian tangle—if it is humanly possible to settle it—is the most important of all questions of the day which affect the well-being of the Empire. Sir Samuel Hoare represented the Conservative party at the Round Table Conference, and the ability with which he dealt with the recondite problems of that beautiful and complicated land astonished all who were not familiar with Sir Samuel's ability to grasp the salient points of an unfamiliar subject in a short time. Now he is to take full responsibility for India. Perhaps in his spare moments he will be able to expedite air mails from Delhi to Calcutta. But India has her own troubles, and we must not expect too much.

We feel some regret, none the less, over this appointment. There is no one whom we would rather see at the Air Ministry, if a Conservative Government is returned to power, than Sir Samuel Hoare. Two terms of office at the same department are rather unusual for any able member of Parliament, and three would be too much to hope for. Sir Samuel Hoare has mastered one novel and complicated subject, and he has started flying upon a course of success and progress. Another subject, equally difficult for the ordinary British citizen to understand, now claims his abilities. We cannot help regretting what appears to be the end of his official connection with flying, but we can heartily congratulate India on her good fortune.

GRAF ZEPPELIN IN ENGLAND

AFTER concluding the Round Britain flight the trip back to Germany was made in rather bad weather over a route which passed through Ostend, Brussels, Aachen, and Cologne. The landing was made at Friedrichshaven at 6.35 a.m. on Thursday in a heavy rainstorm. During the journey, that is just as the airship left our coast, Dr. Eckener sent this message to Mr. Montague, Under-Secretary of State for Air:—

"We have greatly enjoyed our visit to England and Hanworth, and I want to thank you personally for your kindness and to ask you to thank the Air Ministry, and in particular the Civil Aviation and Meteorological Departments for their unfailing and invaluable co-operation."—Eckener.

Log of the Flight, August 18-19

8.0 p.m. Tuesday, left Hanworth Park
Then via Brighton and Worthing to
9.20 over Bognor
Continuing via Southsea, Ryde I. of W., and Bournemouth, to
12.32 a.m. Wednesday, over St. Govan's Lightship (Bristol Channel)

1.48	Blackwater Bank (off Irish Coast)
3.46	Dundrum Bank
5.0	Mull of Galloway
6.12	Dundrennan, Kirkcudbrightshire
6.50	Carlisle
7.5	Newcastle-upon-Tyne
8.0	South Shields
9.40	Leeds
10.42	Selby
11.30	Hull
11.55	Grimsby
p.m.	
2.15	Yarmouth
4.0	Walton-on-the-Naze
5.45	London
7.15	Landed at Hanworth
7.40	Left Hanworth for Germany

On arriving back from her trip round England the airship was somewhat in advance of her scheduled time. The weather was very gusty, and at one time it looked as if no landing would be made after all.

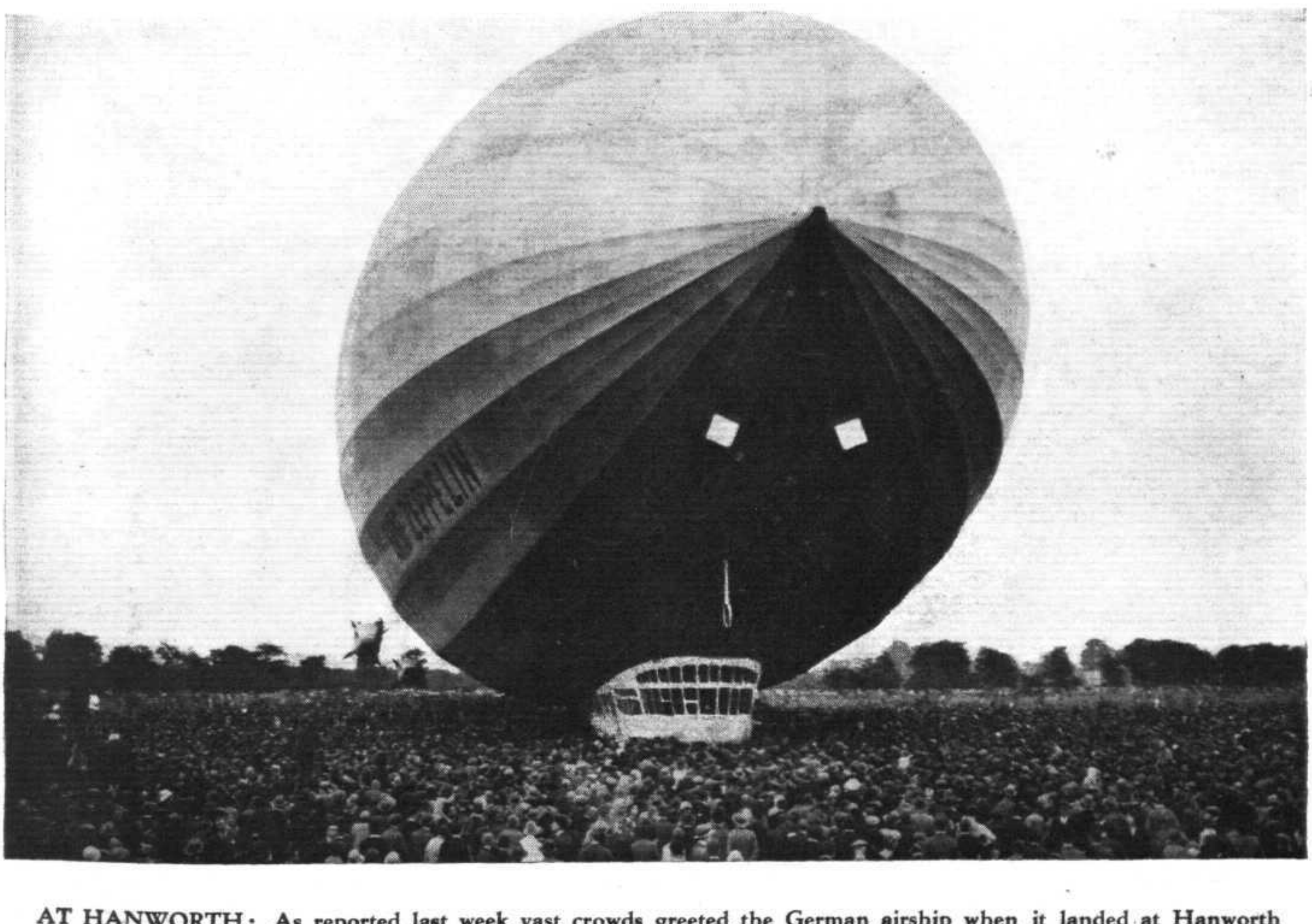
Before landing at Hanworth she went up over the City of London, passing once more over FLIGHT offices at 6 p.m. and again later at 7.45 p.m. as she left the country.

She first arrived over Hanworth from the North-East, and then after passing over the actual landing ground went away to the south, where she remained for some 30 min. At 7.10 she turned and came in low over the trees and made ready to land. The landing itself was not made without difficulty owing to the somewhat high wind and the gusty conditions, but throughout the airship was handled in a masterly manner. There was one occasion after the landing when she threatened to take charge, but a burst from one of the engines which had been kept running restored her equilibrium.

The crowd again broke down the barriers and flooded across the field as soon as the landing was complete, but a rope was hastily put round the control car and secured with stakes. This formed an enclosure, and kept the crowd back from interfering with the process of transferring the passengers and their luggage.

When leaving she rose at once after dropping a little water ballast, and a few moments later was heading for London again.

Following the return to Hanworth on August 19, at the invitation of Col. F. C. Shelmerdine, Director of Civil Aviation, a dinner was given at the Dorchester Hotel at which it was hoped Dr. Eckener would have been present, but weather conditions and other considerations unfortunately stepped in, compelling him to start from Hanworth on the return journey almost immediately after discharging his Round-Britain-Flight passengers. With Col. Shelmerdine presiding, after a reception by Col. Shermerdine and Mrs. Shelmerdine, some 50 guests, including most of those who had journeyed in the Zepp., participated in a charming finale to the airship's visit, what time Dr. Eckener and the Zepp. were on their way back home.



AT HANWORTH: As reported last week vast crowds greeted the German airship when it landed at Hanworth on August 18, as may be seen from the above photo.

Amongst those who accepted invitations for the occasion were the Duchess of Bedford, Lady Bailey, the Marquis of Carisbrooke, Lord Inverclyde, Sqd.-Ldr. Booth, the Hon. Victor and Mrs. Bruce, Lt.-Col. Thwaites, Baroness Jenssen, Hon. Mrs. Ronald Greville, Sqd.-Ldr. S. Nixon, Capt. the Hon. Montagu Parker, Lt.-Col. E. Cold, Mr. Stanley Spooner, Mr. Frank Hodges, Group Capt. A. D. Warrington-Morris, C.M.G., Capt. C. V. Meager, Capt. Barlow, Mr. W. S. Stephenson, Lt.-Col. A. E. Holbrook, D.S.O., Lady Patricia Moore, Major Mealing, Lady Alexandra Haig, Dr. Graf. Albrecht Montgelas, Capt. A. Soldatenkov, Lieut. de Vaisseau Sala and Capt. Don J. Pastor, French and Spanish Air Attachés, respectively, Count Bernstorff, Dr. Auer and Herr von Fries from the German Embassy, in addition to the following passengers on *Graf Zeppelin*: Kathleen, Countess of Drogheda, Lord Newborough, The Master of Sempill, Sir John Foster Fraser, Mr. Ernest Pitman, The Hon. A. F. de Moleyns, Miss M. Anthony, Mr. and Mrs. Cyril Franklin, Mr. Geoffrey Harmsworth, Mr. Austin Eastwood, Capt. Lamplugh, Mr. Arthur Carpmael, Mr. Toby Milbanke, Mr. David Lightfoot, Mr. Richard Coke, Mr. J. E. Hodgson, Mr. H. Ashley and Mr. L. M. J. Balfour (winner of ticket raffled at the Hanworth Club).

MY FLIGHT FROM FRIEDRICHSHAVEN

By OLIVER K. WHITING

On Tuesday, August 18, *Graf Zeppelin* carried in perfect safety and extreme comfort 23 passengers and a crew of 44 from Friedrichshaven to England in a little under nine hours. We left Friedrichshaven as scheduled at 7 a.m. precisely, and crossed the English coast at Hastings (where the Normans landed) on the stroke of 4 p.m. Under this bald statement rests the most interesting journey of my life.

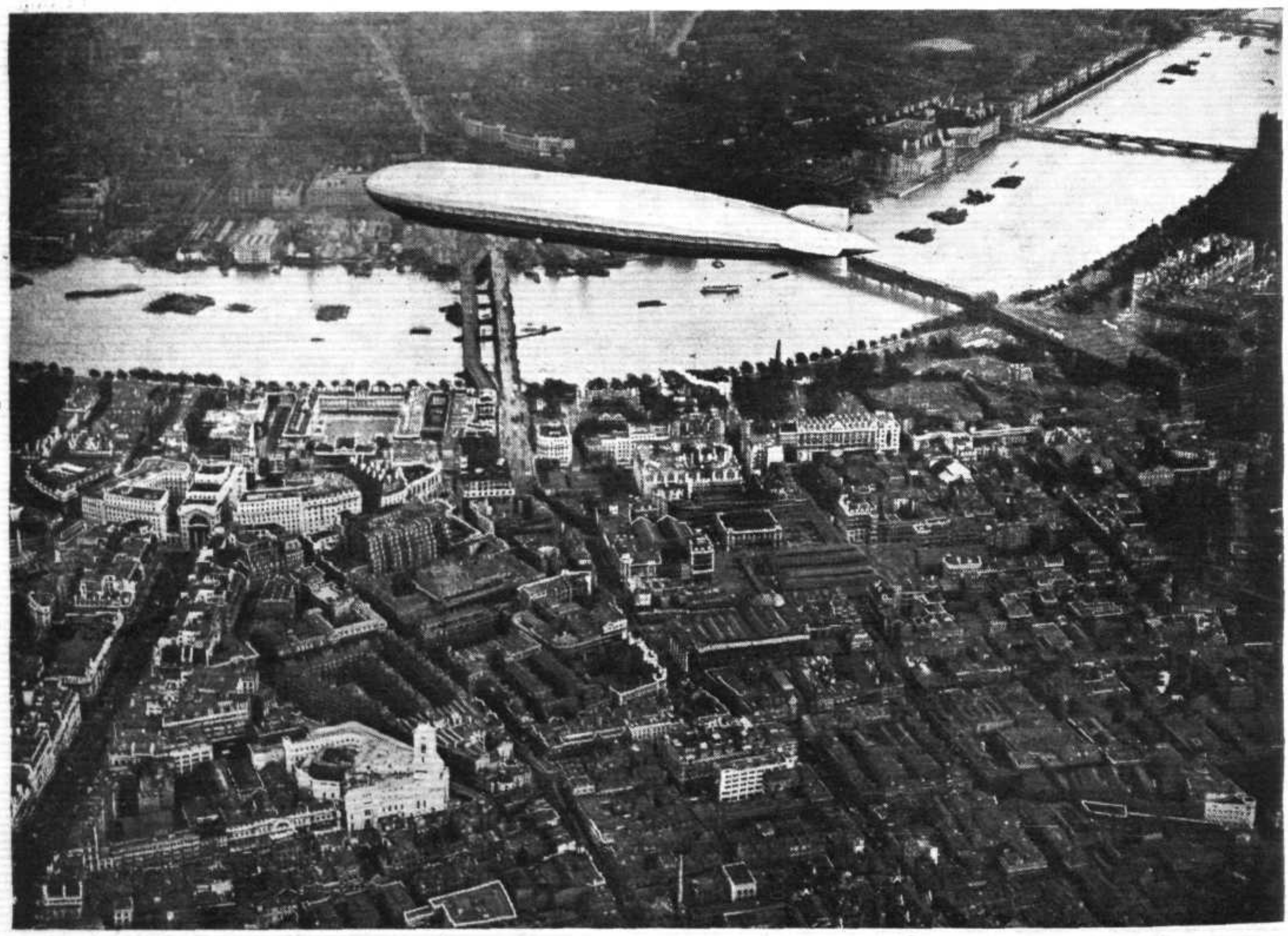
At 6.30 a.m. we entered the giant hangar at Friedrichshaven and climbed aboard. The land crew of 50 then led us from the shed, and on the stroke of 7 a.m. Dr. Eckener gave the signal and we silently rose into the air. At 100 feet the engines started, and we glided through the morning mist out into a brilliant sun.

The accommodation is truly amazing; it comprises an entrance hall, spacing dining room, sitting room and cloak room, and every passenger has his own individual cabin as in a ship at sea. In these every conceivable fitting has been installed—table lights, bells, telephones, radiators, etc., and comfortable furniture. The latter has no provision for securing to the floor—an eloquent testimony to the unfailing steadiness of the ship in the air. There is a well-appointed kitchen, electric cooking, wireless room, chart room and steering house. All the above accommodation is contained in the projecting car, which can clearly be seen from the ground, from which an indication of the vast bulk of the whole may be gathered.

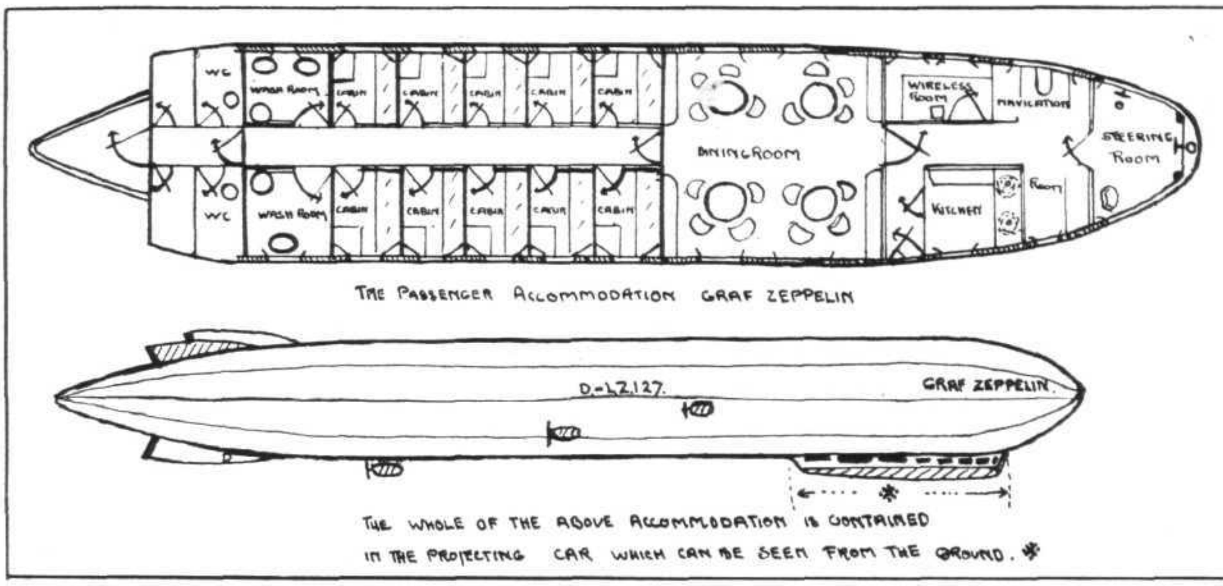
The luxury of this method of travel is undoubtedly one's first impression, but there are two other facts which strike the stranger even more. Firstly, the airship is without vibration or motion of any kind—and remains so even in a storm—and secondly so silent is she to the passengers inside that beyond a distant hum as of a dynamo, it is impossible to tell whether the engines are running or not.

Dr. Eckener told me he had once passed over one of our largest liners in the Atlantic rolling heavily in a storm, whilst he sped calmly onwards at 80 m.p.h. unconscious of the terrific wind—tall flower vases unmoved upon the tables—everything in its allotted place.

Dr. Eckener was especially kind to me, and invited me to his table for lunch. Here it seemed we would arrive over England an hour before we were expected, and so it was arranged we should cruise along the coast. I asked him if we might fly over my home at Farnham, and he



"GRAF ZEPPELIN" IN FLIGHT OVER "FLIGHT": An excellent aerial view of the airship as it flew over London before landing at Hanworth. India House, Aldwych, Kingsway, Waterloo Bridge, etc., may easily be distinguished. The large white building ↑ is the new Masonic Memorial Hall now nearing completion in Great Queen Street, exactly opposite "Flight" Office.



This diagram shows the cabin arrangement of the "Graf Zeppelin."

at once instructed his navigator to plot the course ; it was for this reason that to the surprise of many the Zep approached London from the south-west. Dr. Eckener invited me into the control room after lunch, and I sat at his window pointing out the objects of interest we passed en route.

A Tour of the Ship

To me the most interesting feature of our trip was a personally escorted tour of the entire Zep whilst crossing over France, a privilege extended to a very few. On leaving the dining room (see plan) the door on our left leads into the wireless cabin, where there is always an officer on duty—with his short and longwave aerials—in touch with any station in Europe, and in a few moments can give the exact location of the ship. He was constantly receiving information about our reception at Hanworth, the weather reports from the Air Ministry, and dispatching telegrams for the passengers on board.

Opposite is the kitchen, in which everything is worked electrically by an efficient chef. Between these two cabins one entered the chart room with its large flat table of maps—there sits the captain on duty and navigating officer. Finally we pass on to the steering room—the nerve centre—from which every movement of the ship is controlled. Here we find Dr. Eckener in supreme command, surrounded by a mass of instruments in a beautifully light and airy room. Right in front stands the helmsman with his compass—he is responsible only for the lateral movement—and works with a wheel as in a ship at sea. Similarly equipped is his neighbour on the left, but he attends to the elevator control, and keeps his eye on an elaborate altimeter in place of the compass. Above his head is a slowly moving chart, on which a pin marks the temperature of the air, both inside and outside the ship.

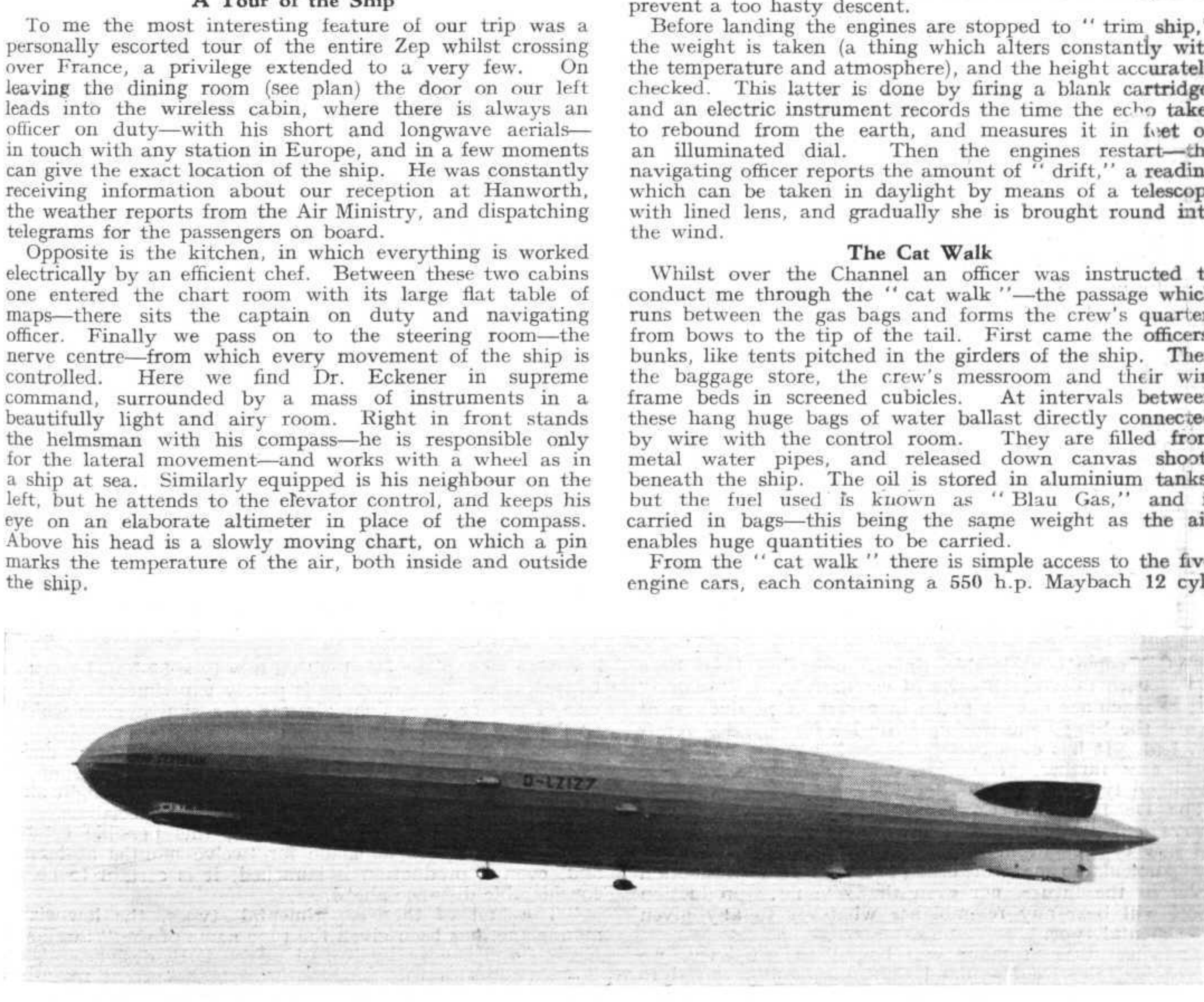
In front of the commander there are dials which show the revolutions of the respective engines. Bell signals to each, and a telephone connected to all parts of the vessel. Here also are the release signals for the water ballast, which is carried in bags at intervals along her entire length. I learnt that contrary to expectation it is usually when the Zep is about to land that the ballast is dropped to prevent a too hasty descent.

Before landing the engines are stopped to "trim ship," the weight is taken (a thing which alters constantly with the temperature and atmosphere), and the height accurately checked. This latter is done by firing a blank cartridge, and an electric instrument records the time the echo takes to rebound from the earth, and measures it in feet on an illuminated dial. Then the engines restart—the navigating officer reports the amount of "drift," a reading which can be taken in daylight by means of a telescope with lined lens, and gradually she is brought round into the wind.

The Cat Walk

Whilst over the Channel an officer was instructed to conduct me through the "cat walk"—the passage which runs between the gas bags and forms the crew's quarters from bows to the tip of the tail. First came the officers' bunks, like tents pitched in the girders of the ship. Then the baggage store, the crew's messroom and their wire frame beds in screened cubicles. At intervals between these hang huge bags of water ballast directly connected by wire with the control room. They are filled from metal water pipes, and released down canvas shoots beneath the ship. The oil is stored in aluminium tanks, but the fuel used is known as "Blau Gas," and is carried in bags—this being the same weight as the air enables huge quantities to be carried.

From the "cat walk" there is simple access to the five engine cars, each containing a 550 h.p. Maybach 12 cyl.



HOMEWARD BOUND: This photo was taken from "FLIGHT" office as the airship passed directly overhead at 7.45 p.m., August 15, on its way back to Germany. (FLIGHT *Photo.*)

engine, and each has an engineer perpetually in attendance. They are, of course, connected by telephone with the rest of the ship, and should any breakdown occur this automatically communicates at one and the same time with the control room and engineers' cabin. Next we reach the fins of her giant tail—these look like sheets of canvas from the ground, but are really rooms 6 feet wide. I was able to climb into the very tip and look out of the window over the Channel.

The Future

The press have levelled three criticisms at the performance of *Graf Zeppelin*:—(1) That she had to alter her course on account of weather conditions. (2) The difficulty of loading passengers on Wednesday night. (3) That she was unable to stay at Hanworth the two hours arranged.

With regard to No. 1, the statement is incorrect. We had intended to pass over Paris, and wirelessed to ask if they would like to see the ship over the city. After some time we got the reply that "the weather bad over Paris." I need hardly say it was the refusal of the permit, and not the weather which caused us to alter our course.

With regard to 2 and 3. Both are accounted for by the inexperience of the landing party, who with all the goodwill in the world could not be expected to compare with the well-trained hands at Friedrichshaven.

The capacity of *Graf Zeppelin* is truly astonishing—in two days she can reach the Pole—she carries enough stores and fuel to take 68 people to U.S.A. from Friedrichshaven without touching land.

She is indifferent to all but the severest weather, and travels at a steady 80 m.p.h. night and day. Such a vessel positively shrinks the size of the earth, and I believe if only we could reduce the cost of running her there are enormous possibilities in the future for this type of transport.

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DEATH OF GROUP CAPTAIN FLACK

We regret to announce that Group Captain Martin William Flack, C.B.E., M.A., M.B., B.Ch. (Oxon), R.A.F.M.S., died on August 16, after a long illness in the R.A.F. Hospital at Halton.

Martin Flack was born in 1882 at Bordon, Kent, and educated at Maidstone and Great Yarmouth Grammar Schools, whence he obtained an open scholarship to Oxford. At the University he joined Keble, and later, University College, and studied medicine under Professors Arthur Thomson and Francis Gotch, and Dr. Haldane.

After graduation he was successful in obtaining a scholarship to the London Hospital, where he became a demonstrator in physiology, and while studying the mechanism of the heart in conjunction with Sir Arthur Keith, discovered the "Keith-Flack Node," the importance of which in the regulation of the cardiac cycle has since been demonstrated by Sir Thomas Lewis and other workers, and has thus proved a valuable factor in the advance of modern cardiology.

For some time he was associated with Sir Leonard Hill in physiological research on respiration, and after qualifying in 1908, gained the Radcliffe Travelling Fellowship in 1909, which enabled him to continue his studies in Liège, Heidelberg and Berne. On his return he became Sir Leonard's assistant at the London Hospital, publishing conjointly a text-book on physiology, and later worked with him under the Medical Research Council.

In the early part of the war he was lent to the Army, and, with Dr. Mervyn Gordon, did valuable work in combating the cerebro spinal fever epidemics, and later Sir Walter Fletcher recommended him to the Services Advisory Board to investigate the medical requirements of aviation. As a result he was gazetted as Lieutenant-Colonel, R.A.M.C., and, on the formation of the Royal Air Force Medical Service, as Wing Commander and Director of Medical Research.

It is no exaggeration to say that the simple system of physiological tests evolved after long practical experiments by Flack has played a fundamental part in aviation medical standards in almost every country to-day. The whole examination of a pilot was expressly designed so that it could be carried out in peace or war with apparatus that an ordinary large suitcase can contain.

With sound foresight and judgment, Flack decided that the flying personnel should set the standards on which the various grades of pilots were assessed, so he based them on the averaged results of large numbers of pilots sent from their units for examination classed as "super," "average" and "borderline," the absolute rejects being obtained from those who had broken down under the strains imposed by aviation and fighting.

These standards and the physiological tests have survived with only very slight modifications to the present day, and have proved their accuracy and worth under varying conditions all over the world. Not only are they of the greatest value in the selection and subsequent care of pilots, both service and civil, but they are the best method which has yet been evolved for detecting what Sir James Mackenzie described as the "pre-disease state," and in ordinary life have been utilised for researches into the medical problems of industrial conditions.

After the war he served as a valuable member of many committees which dealt with aviation and allied subjects, was Milroy Lecturer in 1921, examined at Oxford University, and, in addition to the duties of Director of Medical Research in the Royal Air Force, commanded the Central Medical Establishment.

In spite of these many activities, he found time to carry out investigation into the problems of oxygen and high flying, sea and air sickness, comfort in air travel and other subjects. He was promoted to Group Captain in 1923.

The death of Martin Flack has caused an irreparable loss to both service and civil aviation, as there is no one else to replace his unique experience of the medical problems of flying gained, not only from his personal knowledge, but also from the close contact he had maintained from the earliest days with scientists in other countries who were devoting themselves to the same subject.

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THE DE HAVILLAND "SWALLOW MOTH"

For some considerable time rumour has been busy with tales of all sorts of wonderful new "secret" machines alleged to be in course of production at the Stag Lane works of the De Havilland Aircraft Co., Ltd. It has even been whispered, you are not to let it go any further, of course, that shortly a new De Havilland type is to be marketed at £100!

The De Havilland Company, it must be realised, is always experimenting, and always testing out new ideas and new types. From this it does not follow either that any particular type will become a standard production model in the future, nor even that the next production model will bear any resemblance whatever to any given experimental type.

Knowing that rumour was bound to get busy, we approached the De Havilland Company, and received in reply the following authorised official statement on the subject:—

"The De Havilland Aircraft Co., Ltd., have just completed the construction of a new type light aeroplane—a low-wing monoplane fitted with a new type 80-h.p. Inverted Gipsy engine. The machine is purely experimental, and is one of two or three light aircraft of a similar class which are being designed specially for research purposes.

"In all probability one machine will be a biplane, and, as a result of comparative study, it may be planned ultimately to evolve a new type for the range of light aircraft on which the De Havilland Company specialises.

"The ultimate decision regarding this possible future type is unlikely to be made for twelve months at least, and, even if production is launched, it is certain to be a considerable distance ahead.

"The first of these experimental types, the low-wing monoplane, has been given the type name of the "Swallow Moth," and is actually No. 81 of the D.H. designs.

"Rumours of this machine have been current recently and ridiculous suggestions as to its price have been abroad. Not only is it far from being an established type, but the Company visualises no possibility of achieving lower prices than rule to-day for light aircraft of serious utility."

THE SCHNEIDER CONTEST

IN our last issue we mentioned that one of the brave men who dived in to try to rescue Lt. Brinton after his crash thought that he had felt the pilot in his seat, but could not loosen the belt. The swimmer must have been mistaken, for, after the wreckage had been towed ashore, the body was found, still in the seat, forced back inside the tail of the machine. The fuselage had to be cut open in order to extricate the body. A court of inquiry was opened at Calshot on Thursday, August 20, and later on the same day an inquest was held by Mr. P. B. Ingoldby, the Southampton County Coroner. Medical evidence was given to show that Lt. Brinton's neck was broken, and that this was the cause of death. An analysis of blood is being made to ascertain if there was any poisoning by fumes. The inquest was adjourned to September 3, by which time it was expected that the work of the court of inquiry would be completed.

The funeral was held at Kidderminster on August 21, and was conducted by the Royal Air Force. The King, the Air Ministry and the Admiralty were represented. Messages of sympathy were received by the Air Minister from the King and also from General Italo Balbo, the Italian Air Minister, and were sent on to the relatives of the dead officer.

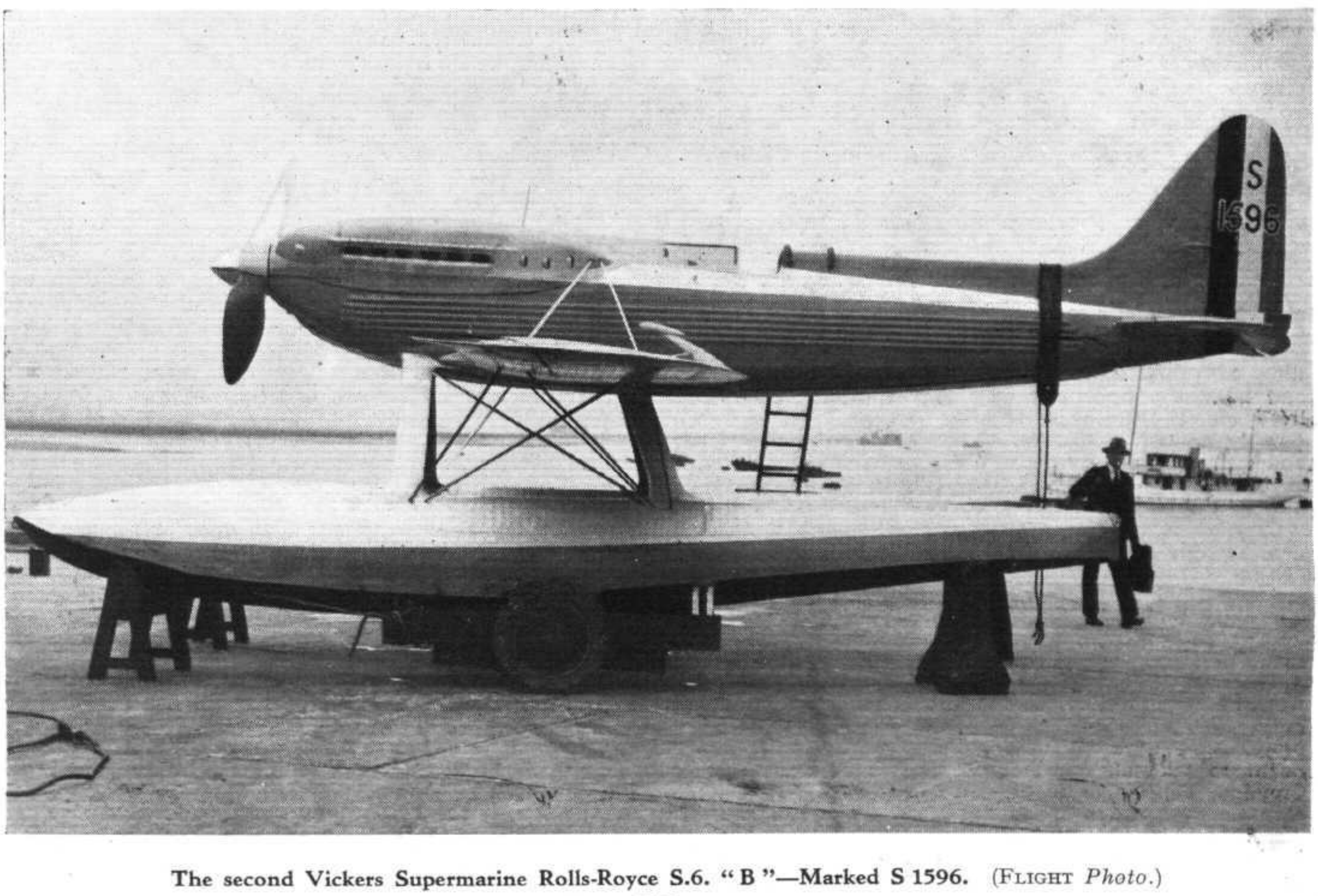
Bad weather has cut down the flying hours at Calshot lately, but whenever possible practice flights have been made. Fl. Lt. Long and F/O Snaith have made flights in S.6 " B " seaplanes, and other members of the High-Speed Flight have been up in practice seaplanes.

In our last issue we published accounts of the careers of the flying members of the High-Speed Flight, but lack of space prevented us from mentioning the engineer officer and the stores officer. We now give brief accounts of their careers.

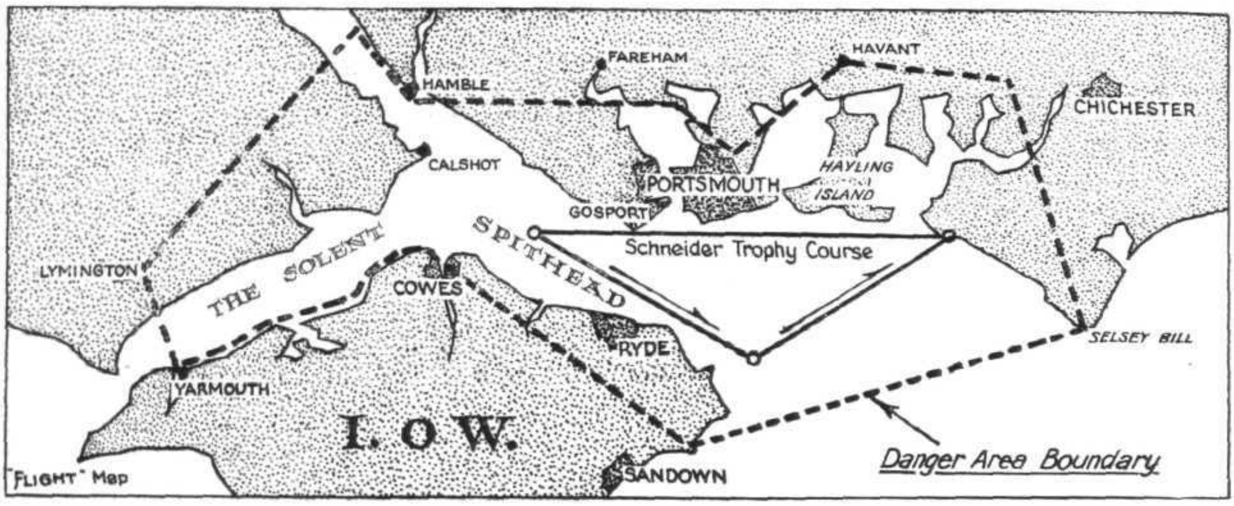
Flight-Lieut. W. F. Dry, R.A.F., was born in 1896 at Yardley, Warwick. He was educated at Mason's College, Birmingham, and at Queen's College, Belfast. He served as a sapper in the Royal Engineers from September, 1914, until May, 1917, when he was granted a commission as second lieutenant in the Royal Flying Corps. After serving with various units as a pilot he was re-classified in September, 1918, as a technical officer, and in the following year was granted a short-service commission. In 1924 he was granted a permanent commission and promoted flight-lieutenant in 1926. For several years he was engaged on technical duties at the Aeroplane and Armament Experimental Establishment at Martlesham Heath, and in 1926 proceeded to India for duties in the aircraft depôt at Karachi. He returned home towards the end of last year. He was appointed in April of this year to be engineer officer of the High-Speed Flight.

Flying Officer M. F. Tomkins, R.A.F., was born in 1893 at Croydon, and was educated at the secondary school there. He joined the Royal Flying Corps as an air mechanic in 1913, and rose to the rank of sergeant-major. He served in 1915 with No. 11 Squadron in France. In 1917 he was promoted second lieutenant. On the formation of the Royal Air Force he was re-classified as a technical officer, and in 1919 was granted a short-service commission, becoming, in 1926, a permanent officer in the stores branch. He served, in addition to many stations at home, in Egypt, and was posted to the High-Speed Flight as stores officer in May of this year.

Doubtless the most popular place from which to see the race will be Southsea. It is the easiest of all points on the mainland to reach by road and rail, and the sea front along which the racing seaplanes will fly is about four miles long. Ample parks for cars and charabancs are being provided, and five enclosures for the public will be arranged along the front, while the South Parade Pier will certainly be a popular view point. Admission to these enclosures, etc., will cost from 1s. up to a guinea. West Wittering is another point which some will seek, as there a turning pylon is to be erected on the mainland. Hayling Island will give a very good view. Those who prefer to cross to the Isle of Wight are sure to find plenty of room along the front and on the pier at Ryde ; while Seaview will give an excellent view of the St. Helen's turning pylon. Though the crowd is sure to be large, and if both challengers put in an appearance, it will be larger than it was in 1929, there will be plenty of room for all. Two years ago some people were kept away through fear of the crowd, but their fears proved needless. This year the arrangements have the experience of the former occasion behind them, and there need be no apprehension about ease of arriving, of parking cars, or of getting away.



The second Vickers Supermarine Rolls-Royce S.6. " B "—Marked S 1596. (FLIGHT *Photo.*)



This map shows the danger area which should be avoided by pilots between August 24 and September 12.

It is announced that the Air Ministry has decided to have the machine N.247, which was badly damaged by the crash in which Lt. Brinton was killed, rebuilt after the race for use in experimental and research flying. The fuselage had to be cut open in order to extricate Lt. Brinton's body, and it seems that reconditioning will mean in practice building a new machine. It is good news that experiments in high-speed flying are not to be abandoned after this contest is over, for much remains to be learnt from such work.

A large quantity of petrol ordered by the French Government has arrived at Calshot, and has been stored in the shed allotted to the French team. It is hoped that the French seaplanes will arrive in due course and use the store now ready for them.

The following statement was issued on August 26 by the Boy Scouts' Association:—"That the Italian air authorities intend entering a team for the Schneider Trophy seems likely from an urgent request received by the Boy Scouts' Imperial headquarters to-day from the authorities for two English Boy Scouts, who can speak Italian, to act as interpreter-messengers for the period of training. Lord Baden-Powell, the Chief Scout, said to-day that, in view of the possible nature of their employment, he intended that preference should be given to Scouts who can swim, 'and every Scout should be able to do so,' he added."

Schneider Trophy Contest

The car parking arrangements for the Schneider Trophy Contest have now been completed at such places as Gosport, Hayling Island and West Wittering. The prices of these parks naturally vary according to their position. Full details can be obtained from Keith Prowse & Co., Ltd., 159, New Bond Street, W.1, and all branches, or National Car Parks, Ltd., c/o Piccadilly Circus Garage, Ltd., Denman Street, W.1.

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Airport News

CROYDON

A MOST regrettable accident occurred on Wednesday last. One of the wireless operators of the Royal Dutch Air Lines absent-mindedly walked into one of the propellers of a Fokker, while it was running, with fatal consequences. His name was Mr. Eimaal, and he was a newcomer on this particular service. He lived about 4 to 5 hours after the accident, although terribly injured. This sort of accident is very unsettling, and casts a gloom over the whole aerodrome for the rest of the day. We express sympathy with the company and to the relatives of the deceased.

Croydon is to join in the National Illumination Week next month, and, I understand, a special display of the lighting arrangements here will be given. Neon tubes are being laid into the ground. The lighting at Croydon is a subject of great interest to many, and people come from miles around to see the night services leave, as it is such an interesting sight.

The *Graf Zeppelin* caused the Air Ministry staff here to work at high pressure, as the airship was making all her radio communications through Croydon. This meant a pretty hard time with the ordinary traffic routine. We ought to take off our hats to the Air Ministry side of Croydon, as, unlike many Government offices, they do earn their keep, and are always ready for any emergency. The new ground on the west boundary of the aerodrome is shortly to be opened, and will add about another 700 or 800 yards to the aerodrome. We would suggest a special row of hangars, and an entrance in Forresters Drive on that side for the special use of the joyride and school concerns. It would at least have the effect of keeping them clear of the Continental traffic. The grass on this new part has been about two years getting into good condition. A lesson might well be learned from the ground on the opposite of Purley Way in front of the aerodrome. Six months ago it was full of rhubarb, vegetables and general market-garden produce; to-day it is a perfect grass stretch, flat, and in good condition, and is shortly to be opened as a recreation ground by the Croydon Borough Council. They have done in six months a job which has taken four times as long on the aerodrome, and it is in a more perfect state. During the recent torrential rains, the aerodrome has been a veritable quagmire, and machines landing have sent sprays of mud and water about 20 feet into the air. Were it not that the ground drained quickly, many machines would have been bogged.

Traffic in general keeps fairly normal for the time of year. The time is swiftly approaching when many of the services will be curtailed for the official English winter. At the moment it is like winter, but we call it summer.

Personal Flying Services still keep busy with special charter work, and their two engineers are working very hard.

The traffic figures for the week were:—Passengers, 1,547; freight, 80 tons.

P. B.

Private Flying & Club News

GROSVENOR CUP RACE

THE Newcastle-upon-Tyne Aero Club members vindicated themselves on Saturday last, August 22, and showed that in spite of all the adverse reports which have been spread about their efficiency they are capable of organising a thoroughly successful display, pageant or meeting, whichever you prefer to call it.

They were not so lucky as to get an immense crowd to attend, for no doubt the adverse effect of some of their recent meetings, especially the most recent and most widely advertised ones, will have to be lived down before the general public again have confidence enough to think that they are going to get their money's worth. Saturday's meeting should, however, have had the desired effect, and it is to be hoped that next time a large proportion of those who on Saturday lined the hedgerows will come into the enclosures of their own free will. If they don't, then the police should be empowered to "move them on."

The actual attendance was somewhere in the neighbourhood of 10,000, so that although the Club may not reckon this as a large crowd, we feel that it is only a matter of comparison, and that, bearing in mind what has gone before, they should be well content.

The organisation and control of the meeting itself was in the hands of Capt. J. D. Irving, who was therefore responsible for the smooth way in which everything was carried through. He was ably backed up by other members of the Club, who acted as Marshals, and also by the pilots of the competing machines who invariably got out on to the starting line as soon as they were asked to do so. This sort of co-operation is the thing which helps a meeting to go through smoothly, more than anything else, and the complete absence of anyone who tried to quibble or dictate to those in charge was a very pleasing feature of the whole afternoon.

THE GROSVENOR CUP WINNER: Sqd. Ldr. Woodhouse who won the Grosvenor Cup Race in a Bluebird (Gipsy I), talking to the Lady Mayoress after the race.

The Grosvenor Cup Race was the main attraction on the programme, although as a spectacle the two displays given by the R.A.F. must have been better value for the general public. For future occasions we would suggest that the aircraft be parked at some point towards the end of one of the public or club enclosures, for as they were on Saturday they were straight in front of the crowd, and certainly, for a large part of the R.A.F. display, they blocked the view badly. Another criticism which can justifiably be levelled against the arrangements is one on the way in which the question of joy-riding was carried out. Mr. Fielden was allowed to park the Handley-Page W.8 right in front of one of the enclosures, and also actually to make flights while the races were in progress. On one occasion he landed as two machines were coming in to land during the Relay Race, and consequently that heat had to be re-run. Joy-riding must be kept quite apart from the programme of such a meeting as this. We fully understand the desirability of having means by which people can take flights, but if this is to be done during the flying programme it must be carried out on some part of the aerodrome where there is absolutely no interference with the machines taking part in the display, otherwise it should be left until the end of the show altogether.

The broadcasting arrangements were also not above criticism. The type of loud-speaker used was that long trumpet kind, and they are never so good as the open box variety. The music came through fairly well when one was not too close to the speaker, but speech was very poor. This was rather a pity, as the programme included a display of wireless controlled formation flying, wherein the orders given by the Flight-Commander were received by the ground station as well as by the aircraft and broadcast through the speakers, but unfortunately they were somewhat indistinct. The actual announcing, as distinct from the mechanical side of the broadcasting, was in the very capable hands of Mr. E. C. Brown, who by the way has now taken charge of the aviation department of Alexander Duckham & Co., Ltd. Mr. Brown's announcing has now become an institution at these meetings, and he has naturally developed a technique which is nearly flawless. He knows just how to temper a technical description of aerobatics and such like manœuvres so that the general public feel that they have really learnt something about how such things are done, and by virtue of his connection with the trade he is able to bring in a reasonable amount of publicity for the makers of the various aircraft taking part in the meeting without making this uninteresting or too blatant.

Clubs usually manage to secure some support from the local press at these meetings in return for facilities to sell the papers on the aerodrome. On this occasion it really seems as if the management of at least one paper took a very unfair step when they printed the whole programme in full, together with the times of the events. They must have realised that the Club would be looking towards getting a substantial profit on the sales of their own programme, but naturally the fact that the same list of events could be obtained for the sum of one penny instead of the sixpence charged for the official programme meant that the sales of the latter were very small, and probably resulted in a loss to the Club instead of the profit which they had expected.

In a meeting like this the weather is one of the most important factors and, this being England, is one which keeps people guessing right up to the last minute. On Saturday we were lucky—the spell of bad weather which had been the lot of most of us for so long being broken. The wind was light and from a northerly direction, which made the take-off in a very good direction for the meeting, while the clouds, although fairly thick, were at such a height that they did not impede aerobatics and flying in general, in fact, as one Club member said, the visibility was too good; meaning that had it been bad then,

as they knew every inch of the country around their own aerodrome, they would have had a very great advantage over other pilots in the Grosvenor Cup Race. The only fly in the ointment was the temperature. Cramlington Aerodrome must be the coldest place in England, and although we have been there at all times of the year we have never yet been warm. Saturday was not only not warm but was definitely cold, and standing watching an Air Meeting when it is really cold is not most people's idea of pleasure.

The programme itself started with an arrival competition with a prize for the pilot who landed nearest to noon. This was won by Mr. H. R. A. Edwards flying his ancient Avro Baby (Cirrus I).

The next items were the two heats of the Grosvenor Cup Race, and these will be dealt with together a little later.

A parade of most of the aircraft present followed, and was carried out in the usual way, the aircraft taxying round so that those in the enclosures could see them and then flying round a circuit of the aerodrome before landing; some twenty aircraft took part, most of whom were visitors. A special prize was given for the best kept aircraft, this being won by Lord Grimthorpe for his Puss-Moth (Gipsy III).

F/O. H. H. Leech, whose father, Dr. J. W. Leech, J.P., is the Sheriff of Newcastle-upon-Tyne, gave a very clean display on the Martlet (Genet II). His aerobatics were for the most part carried out at just right height and in front of the enclosures where the crowd could best see them. Mr. Leech was on his mettle, because he originally learnt to fly at Cramlington before entering the R.A.F., and the eye of his fellow club members was therefore somewhat critical. He fully justified his reputation, however, and although not as spectacular as we have seen him, he nevertheless managed to put the Martlet through all the ordinary aerobatic manœuvres in a very masterly manner, but did not satisfy the cynic who was heard to say that "After all it does not matter if he does crash as his father is a doctor!"

No. 28 (Army Co-operation) Sqd. from Catterick had sent over a flight of Atlases, and these, piloted by Flt.-Lt. R. H. S. Spaight as Flight-Commander, with F/O. J. S. Shakespeare, F/O. N. C. Hyde and P/O. R. B. Wardman under him, put up a well arranged show. They demonstrated how an aircraft, which had been doing reconnaissance duty ahead of a punitive duty and had had to make a forced landing, could set up a message on a line so that another aircraft could come along and pick it up. We had to assume the existence of an ambush, as exemplified by a horde of Arabs (?), which harassed the damaged aircraft with desultory and inaccurate fire from all manner of weapons, but even allowing for the erratic aim of these we cannot understand how the observer was able to roam about in the open and erect his "clothes line" ready for the other machine to come and pick up the message; probably his overalls were of the "warranted bullet proof" type. He got the message rigged safely, and the other machine duly picked it up, while two other aircraft poured an incessant fire on to the Arabs. The machine which had picked up the message now returned and landed close to the stranded machine, and the four occupants made hectic efforts to start the engine of the damaged (?) one. After a considerable interval this was achieved, and they all flew happily away. The fire from the two low flying machines was evidently of the same variety as that of the "Arabs," for no sooner were the machines well away than every man of the ambush arose and legged it home!!

AT THE FINISHING LINE: (L. to R.) The Lord Mayor of Newcastle-upon-Tyne and Dr. Leech (both of whom were judges); Mr. Rowart and Capt. Dancy, handicappers; and (sitting) Mr. Bidlake, timekeeper.

Aircraft.		Engine.	Pilot.	Entrant.	Handicap.	Finished at	Average Speed.	Place.
HEAT 1					Min. sec.	Min. sec.	M.p.h.	
G-AADE	Widgeon	Gipsy I	C. S. Napier	C. S. Napier	2 39	33 54	103½	**1**
G-AAHP	Moth	Gipsy I	Entrant	Lord Douglas Hamilton	4 39	34 07	110	**2**
G-EBRO	Widgeon	Cirrus III	Entrant	J. G. Ormston	0 00	34 08	95	**3**
G-EBQV	Moth	Cirrus II	F. J. McGevor	Newcastle Ae C.	0 31	34 19	96	**4**
G-EBWI	Moth	Cirrus II	C. W. Duffie	Newcastle Ae. C.	1 02	34 19	97¼	**5**
G-AAHV	Spartan	Hermes II	Entrant	Miss C. Leathart	2 01	34 28	99¾	**6**
G-ABIX	Active	Hermes IIb	Flt.-Lt. C. Wincott	C. R. Belling	9 33	34 42	129	**7**
G-AAHE	Avian	Cirrus III	Entrant	A. C. Johnson	1 32	34 51	97¼	**8**
G-ABMA	Moth	Gipsy II	Entrant	H. R. Murray-Phillipson	3 15	35 11	101½	**9**
G-AACC	Bluebird	Hermes II	F/O. E. Edwards	R. McAlpine	6 24	36 27	108	**10**
HEAT 2								
G-ABAG	Moth	Gipsy I	Entrant	T. C. Fawcett	6 03	37 26	103	**1**
G-AAUU	Bluebird	Gipsy I	Sqd.-Ldr. J. Woodhouse	H. Peake	4 16	37 30	97½	**2**
G-ABJH	Moth	Gipsy II	Entrant	L. M. Balfour	7 57	37 37	109¼	**3**
G-AAZF	Swift	Pobjoy	Sqd.-Ldr. J. Robb	Capt. G. Fane	10 26	37 48	118½	**4**
G-ABED	Avian	Hermes II	Entrant	Miss W. Brown	9 58	37 50	116½	**5**
G-ABBN	Martlet	Genet II	Entrant	F/O. H. H. Leech	6 13	37 51	102½	**6**
G-AAOC	Bluebird	Hermes II	D. Atcherley	A. Longmore	4 36	37 57	97¼	**7**
G-EBUZ	Moth	Cirrus II	C. Thompson	Newcastle Ae. C.	3 34	39 42	89½	**8**
G-EAUM	Avro Baby	Cirrus I	Entrant	H. R. Edwards	0 00	47 30	68	**9**
G-ABCI	Klemm	Cirrus III	Entrant	D. I. Kennard	5 26	Retired.	—	**10**
Final								
G-AAUU	Bluebird	Gipsy I	Sqd.-Ldr. J. Woodhouse	H. Peake	0 42	32 22	102½	**1**
G-EBRO	Widgeon	Cirrus III	Entrant	J. G. Ormston	0 00	33 23	97	**2**
G-ABAG	Moth	Gipsy I	Entrant	T. C. Fawcett	2 29	33 35	104	**3**
G-AADE	Widgeon	Gipsy I	Entrant	C. S. Napier	2 39	33 41	104¼	**4**
G-ABJH	Moth	Gipsy II	Entrant	L. M. Balfour	4 23	33 57	109¼	**5**
G-AAZF	Swift	Pobjoy	Sqd.-Ldr. J. Robb	Capt. G. Fane	6 52	34 04	119	**6**
G-AAHP	Moth	Gipsy I	Entrant	Lord Douglas Hamilton	4 39	34 07	110	**7**
G-EBQV	Moth	Cirrus II	F. J. McGevor	Newcastle Ae. C.	0 31	34 13	96	**8**

Following this amusing event the flight carried out a demonstration drill. They took up various formations when ordered to do so by wireless from the Flight-Commander. These orders were picked up a ground station and relayed through the broadcasting system so that the spectators could hear the orders being given. The whole operation was fairly successful and certainly interested the crowd.

The final for the Grosvenor Cup Race was the next event, as the heats had been run off earlier in the programme.

The complete race can be followed from the tables, which well illustrate the success achieved by Messrs. Dancy and Rowarth in their handicapping. About the race itself there is little to say. It is open to all makes and types of aircraft of unladen weight not exceeding 1,500 lb. The course was a triangular one, over which two laps had to be flown, making a total distance of 53½ miles. The organisation was very good indeed, and there were no untoward incidents other than the retirement of Mr. D. Kennard in his heat owing to sooted up plugs, a much regretted matter, as Mr. Kennard is well known with his black and white Klemm (Cirrus III) at Cramlington, and was a fancied pilot for the race.

ON A CORNER: A Bluebird rounding a corner.

One very noticeable feature was the increase in the excellence of cornering. Many of the competitors were amateurs who have been racing consistently during the last season or so, and the way they handled their machines on the corners showed that the more experienced pilots have little advantage over them.

The winner was Sqd.-Ldr. J. W. Woodhouse in a Bluebird (Gipsy I), who flew with his entrant, Mr. H. Peake, as his passenger. The prize for the fastest time in the race went to the Arrow-Active flown by Flt.-Lt. C. B. Wincott, who put up a speed of 129 m.p.h.

Following this race there came a demonstration of combined aerobatics by Flt.-Lt. H. M. A. Day and P/O. D. R. S. Bader, both of No. 23 (Fighter) Sqd., flying Gamecocks (Jupiter). This was without any doubt the finest exhibition we have ever seen. Their timing was perfect and their showmanship really good. They managed to keep well up wind, did not gradually drift across the aerodrome in the way we have so often seen, and were at all times just the right height to be seen comfortably. Particularly spectacular was their method of flying off up the aerodrome side-by-side after having done a dive and rocket opposing each other. This was accomplished by an aileron turn inwards while nose down after the rocket. The display was doubly interesting in that it was probably the last time these Gamecocks would be seen in public, as we were told that they had been kept on charge in the squadron, which has since been equipped with Bulldogs, solely for this display.

A "NATIVE": F./O. Leech, who put up a fine display on the Martlet (Genet) at the meeting, talking to Flt.-Lt. N. Comper, designer of the Comper Swift.

The parachute descent was made with a dummy, as Capt. Stewart is still suffering from the effects of his dislocated shoulder.

The Relay Race which finished the programme was somewhat of a wash-out. In this it was necessary for the machines to take off, fly a circuit, and then land between two lines on the aerodrome. Those who landed short were at once disqualified, while those who over-shot had to man-handle their machines by themselves back again to between the lines. After this the second pilot could take over and fly the

THE FASTEST IN THE RACE: Mr. Thornton, designer, and Flt. Lt. Wincott (R.) in front of the Arrow Active before the race.

second circuit to come in and land for the finish. In both the heat and the final the only machine not disqualified was the Avro Baby (Cirrus I), flown by the brothers Edwards. On the last lap, however, Mr. E. C. T. Edwards had a forced landing in a very small field indeed. His brother rushed over in a car and found that the trouble was only shortage of fuel. So a rapid fill up was made. By managing with exceptional skill to get out of the field and fly back he won the race, thus gaining the Cup which had been presented by Mrs. de Lancey Wilson. A very fine effort indeed.

After the meeting a dinner and dance was held at Tilleys. Col. Sir Joseph Reed, the President of the Club, was in the chair. The speech making was commendably short. Ald. David Adams, the Lord Mayor of Newcastle-upon-Tyne, proposed the toast of the Club, and made an excellent case for the establishment of a municipal aerodrome. It is not often that we hear such progressive views as these expressed by a provincial Lord Mayor, and we trust that he got his just backing from his aldermen and councillors and that before long we shall hear that there is a Newcastle Municipal Aerodrome.

BROOKLANDS NOTES. — The Curse of St. Swithin reduced the hours spent in the air at Brooklands during the week to 35. But the machinations of the tearful Saint were of no avail against the growing popularity of the School's indoor work. Large numbers of pupils came down specially to attend the lectures in meteorology and navigation. Steady activity in the repairs shop goes on, and an average turn out of three machines weekly is being maintained. The indoor activities of Brooklands promise to be still further stimulated by the start of the College of Aeronautical Engineering's first term. Already 286 applications have been received by the College, and 40 pupils will be selected for a thorough training in the technical and administrative sides of aviation, thus bringing Brooklands a step nearer to the realisation of its future as a University of the Air.

Three new pupils joined the School during the week, one aiming at a "B" licence. The latter came originally to Brooklands from America some time ago to learn to fly, and has returned for advanced instruction. The worldwide appreciation of Brooklands as a training centre is gratifying to the School, which has pursued a policy of attracting pupils from the four corners of the globe. Mr. Radcliffe was successfully launched on his first solo, and Mr. Handasyde, the Brooklands winner in the Tatler Scheme, went solo after five hours' dual. Messrs. Rambout and Destur took their final tests for their "B" licences.

The new club-house is now well on the way to completion, and its progress is watched by private owner visitors with keen anticipation of new comforts in store for them.

ROYAL AVIATORS: Princess Ileana and her husband, the Archduke Anton of Hapsburg, standing beside their "Puss Moth" a wedding gift from King Carol. (FLIGHT *Photo.*)

CINQUE PORTS FLYING CLUB.—A continuation of the remarkably bad weather reduced flying time to 23 hr. 5 min. for the week ending August 16. On Thursday Mr. G. E. T. Story flew from Baldonnel in 3 hr. 50 min. in his Cirrus LL Moth GEBTZ. During the week the Duke of Grafton was back at Lympne.

The Club was represented at the St. Hubert (Belgium) Rally by Miss Aitken and Mr. Waller—whether Miss Aitken has won the Ladies' Cup is not yet clear, but it is hoped that such may be the case.

The bomb-dropping competition which should have been held on Sunday, the 16th inst., had to be abandoned owing to the unsuitability of the weather.

THE WILTSHIRE LIGHT AEROPLANE CLUB.—It is proposed to form an Aero Club under the above title. The Aerodrome and Club house will be situated within three miles of Salisbury.

The equipment will consist of "Redwing" light aeroplanes ("Genet" engines). In order to form the club it is essential to ascertain the potential number of members. Will all those who are interested and would like to join please write to J. E. Doran-Webb, Gaston Manor, Tisbury, Salisbury, Wilts.

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New D.H. Orders

AMONG the new orders which de Havilland have recently received are two Gipsy I "Moths" for the Irish Aero Club, which have been sold through Brian Lewis and C. D. Barnard, Ltd., of Heston Air Park, Middlesex, and 30, Conduit Street, W.1; also a Gipsy III engine for the Fiat Co. in Italy. This latter is particularly interesting, as it comes directly after the success of the Gipsy III engine in the recent Circuit of Italy. The Fiat Company actually had seven of their own machines entered, all of which were fitted with their own engines. The performance of the Gipsy III must, therefore, have impressed them very much.

The Grosvenor Cup Race

SQ.-LDR. WOODHOUSE, who won the Grosvenor Cup Race at Newcastle-upon-Tyne on August 22 in a Bluebird, used Pratts' petrol to take the necessary "horses" out of his Gipsy I engine. K.L.G. plugs and Wakefield's Castrol oil no doubt also had a great deal to do with his success. For transmitting the power of his engine to the air, and so drawing himself through it at 102½ m.p.h., he had a Fairey metal airscrew fitted, and finally, for finding his way accurately round the course, he used a Husun compass.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

August 28, 1931

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CORRECTION OF AEROPLANE PERFORMANCE TO STANDARD ATMOSPHERE (DENSITY BASIS).

By Clifford W. Tinson, F.R.Ae.S., M.I.Ae.E.

(*Concluded from page* 55)

CLIMB TIMES, NORMALLY ASPIRATED ENGINE.

Taking the normally aspirated engine, and assuming in the first place that the reduction of rate of climb is regular throughout, the trial rate of climb line is drawn and the time to any chosen altitude A_1 is calculated from the formula:—

$$T = \frac{2 \cdot 303}{r} \log \left(\frac{C_2}{C_1}\right)^*$$

where T = Time in min. to altitude A_1;

C_1 = Rate of climb at altitude A_1, ft./min.;

C_2 = Rate of climb at ground level, ft./min.

If A_1 is the altitude at which C_1 is the climbing rate, and A_2 is the altitude at which C_2 is the climbing rate (ground level in this case), then reduction of climbing rate

$$r = \frac{C_2 - C_1}{A_1 - A_2} \text{ ft. per min. per ft.}$$

The absolute ceiling is given by

$$H_{max} = A_1 + \frac{C_1}{r} \text{ ft.}$$

EXAMPLE.

Climbing rate, ground level, C_2 = 1,645 f.p.m.
Climbing rate, at 17,000 ft., C_1 = 440 f.p.m.
Altitude chosen, A_1, = 17,000 ft.

Reduction in Climbing Rate—

$$r = \frac{C_2 - C_1}{A_1 - A_2}$$

$$= \frac{1{,}645 - 440}{17{,}000 - 0}$$

$$= 0 \cdot 0709 \text{ ft. per min. per ft.}$$

Time to Altitude A_1—

$$T = \frac{2 \cdot 303}{r} \log \left(\frac{C_2}{C_1}\right)$$

$$= \frac{2 \cdot 303}{0 \cdot 0709} \log \left(\frac{1645}{440}\right)$$

$$= 18 \cdot 62 \text{ min.}$$

Ceiling, Absolute—

$$H_{max} = A_1 + \frac{C_1}{r}$$

$$= 17{,}000 + \frac{440}{0 \cdot 0709}$$

$$= 23{,}200 \text{ ft.}$$

After adjusting the rate of climb time until the time to altitude chosen agrees with the climb time, check the times to some other altitudes of which one or more is near the ground, in order to ensure that the general inclination of the rate of climb line is correct.

CLIMB TIMES, SUPERCHARGED ENGINE.

In the case of the supercharged engine, commence by assuming that the rate of climb is represented by two straight lines joining at the supercharged limit as described above.

The time to climb from zero height up to the supercharge limit will be:—

$$T = \frac{A_s}{\frac{1}{2}(C_2 + C_s)}$$

where T_1 = Time to altitude A_s in min.;

A_s = Altitude of supercharge limit, ft.;

C_2 = Rate of climb at ground level, ft./min.;

C_s = Rate of climb at altitude of supercharge limit, ft. per min.

Above the altitude A_s, the times to be *added* to T_1 will be:—

$$T_1 = \frac{2 \cdot 303}{r} \log \left(\frac{C_s}{C_1}\right)^*$$

where T_2 = Time to climb from altitude A_s to altitude A_1, in min.;

* From R. & M., No. 1316.

C_s = Rate of climb at altitude A_s, ft./min.;
C_1 = Rate of climb at altitude A_1, ft./min.

If A_1 is the altitude at which C_1 is the rate of climb, and A_s is the altitude at which C_s is the rate of climb, then reduction of climbing rate,

$$r = \frac{C_s - C_1}{A_1 - A_s} \text{ ft. per min. per ft.}$$

The absolute ceiling is given by

$$H_{max} = A_1 + \frac{C_1}{r} \text{ ft.}$$

EXAMPLE.

Climbing rate, ground level C_2 = 1,300 ft./min.
Climbing rate at 11,000 ft. C_s = 1,700 ft./min.
Climbing rate at 25,000 ft. C_1 = 596 ft./min.
Altitude of supercharge limit A_s = 11,000 ft.
Altitude chosen A_1 = 25,000 ft.

Time to 11,000 ft.—

$$T_1 = \frac{A_s}{\frac{1}{2}(C_2 + C_s)} = \frac{2 \times 11{,}000}{1{,}300 + 1{,}700} = 7 \cdot 34 \text{ min.}$$

Reduction in Climbing Rate above Altitude A_s—

$$r = \frac{C_s - C_1}{A_1 - A_s} = \frac{1{,}700 - 596}{25{,}000 - 11{,}00} = 0 \cdot 0788 \text{ ft. per min. per ft.}$$

Time from Altitude A_s to Altitude A_1—

$$T_2 = \frac{2 \cdot 303}{r} \log\left(\frac{C_s}{C_1}\right) = \frac{2 \cdot 303}{0 \cdot 0788} \log\left(\frac{1700}{596}\right) = 13 \cdot 30 \text{ min.}$$

Total Time to Altitude A_1—

$$T_T = 13 \cdot 30 + 7 \cdot 34 = 20 \cdot 64 \text{ min.}$$

Ceiling Absolute—

$$H_{max} = A_1 + \frac{C_1}{r} = 25{,}000 + \frac{596}{0 \cdot 0788} = 32{,}560 \text{ min.}$$

After adjusting the rate of climb lines until the times calculated as above (to height near the ceiling) agree with the climb curves, check some times near the ground and to some altitudes near to the supercharge limit, to verify whether the rate of climb curve below this limit is a reasonably straight line.

It has been stated that the rate of climb curve is usually a straight line. There will be cases, however, where the rate of climb will be found to be bent, possibly when the engine has been getting too hot or too cold during part of the climb, so that the quality of the mixture is affected. In such cases, the process of checking back from the trial rate of climb curve to see that the times agree will give the necessary indication.

With modern aircraft engines any defects of the nature suggested are usually discovered and remedied before performance trials are carried out.

CORRECTION OF SPEED.

Since the pressure in the pitot tube is proportional to the density of the air and to the square of the speed of the pitot tube through the air, it is only necessary to divide the indicated air speed by the square root of the relative density to obtain the corrected air speed, and to add to this the pitot position error, if known, to give the true air speed.

In order to fill in the table, the following data are required from the pilot's report:—

(*a*) Height from locked altimeter, feet;
(*b*) Air temperature at altimeter height;
(*c*) Indicated air speed.

As in correcting climb, the standard height is found from:—

$$H_s = (1.238\ H_a \pm 120\ t_o - 1{,}800).$$

H_s = Standard height in feet.
H_a = Altimeter height in feet (locked altimeter).
t_o = Observed temperature in degrees C.

(The plus sign becomes minus, of course, if t_o is negative.)

The engine revolutions in the pilot's report should also be entered, for record purposes.

The standard heights thus determined are entered in the appropriate column in the table, and the values of relative density and the square root of relative density corresponding to the standard heights are found and entered. The figures for relative density may be taken from the N.A.C.A. Report No. 218. They are shown in Fig. 3.

The corrected speed is thus obtained from:—

$$V = \frac{\text{I.A.S.}}{\sqrt{\frac{\rho}{\rho_o}}}$$

V = Corrected air speed, miles per hour, knots or kilometres.
I.A.S. = Indicated air speed, miles per hour, knots or kilometres.
$\frac{\rho}{\rho_o}$ = Relative density at standard height considered.

If the pitot position error is known, it should be entered and added to the corrected air speed to give the true air speed, which will be the true air speed at the particular standard height considered.

The values of standard heights as found will almost certainly be uneven members; therefore the speeds should be plotted against standard height so that they may be stated in the remaining column against regular intervals of height, *i.e.*, at 10,000, 15,000, 20,000 ft., etc.

PITOT HEAD POSITION ERROR.

The pitot position error depends on the position of the head in the gap if the machine is a biplane, on the stagger, and possibly on other factors in addition; for example, it may depend on the relative chords of the wings of an unequal biplane. It is not possible at the present time to base the position error on calculation, and its values must be found experimentally for different conditions of flight.

Whilst the position error may be stated generally as varying between + 0.5 and + 3.5 miles per hr., it does not appear possible to connect these values with any definite circumstances, and for this reason it is advisable to leave the position error column in the table vacant in cases where no test figures are available for the particular machine of which the performance is being corrected.

FORCES ON THE ENGINE MOUNTING OF A SPINNING AIRCRAFT.

By D. WILLIAMS, B.Sc., A.M.I.Mech.E.

Mr. Williams, who is one of the Technical Officers at the Royal Aircraft Establishment, Farnborough, contributed, as our readers may remember, an article on "A Graphical Method of Stressing Aeroplane Spars," which was published in our issues of March 27 and April 24, 1931. In the present issue Mr. Williams turns his attention to the loads which may be thrown on the engine mounting of a spinning aircraft. When, as often happens, the throttle is opened fully in an endeavour to get out of a spin, fairly considerable forces and couples are, owing to the rotation of the aircraft about its centre of gravity, and the vertical dropping velocity, applied to the airscrew as a result of its velocity in its own plane. When such loads are added to those produced by gyroscopic couples, centrifugal forces, engine thrust and torque, it is found that the true factor of safety of a fighting aircraft of the high-performance type may be as low as 1.5, showing the desirability of making an estimate of these loads during design.

It may be accepted that high-performance aircraft, especially of the military type, are always liable to be put into a spin, either by accident or design. It may also be accepted that, should a pilot experience any difficulty in resuming normal flight, he is likely to open up his engine in a few bursts at full throttle in his attempt to convert the spin into a normal dive.

During such bursts the engine mounting is subjected to a combination of forces which may or may not be serious, according to the type of mounting. It may be said at the outset that, so far as existing aircraft are concerned, there is no reason to believe that these forces are of such magnitude as to become a determining factor in the structural design. On the other hand, having regard to the "fluidity" of modern aircraft design, the forces dealt with here are too important to be entirely neglected, and a design which departs materially from current practice should not be considered satisfactory unless checked from this point of view.

The exact computation of loads incident on the engine mounting of a spinning aircraft can never be done with precision by calculation, and we are reduced to making certain simplifying assumptions which, though not representing the true flight condition, are a fair approximation thereto, and are, if anything, too severe.

The flight condition is defined as follows:—

(*a*) The aircraft is assumed to be rotating in a perfectly flat spin at the rate of 5.0 radians per sec. about a vertical axis through its c.g. (Rates of spin varying between 1.5 and 4 rad./sec. are quoted in R. & M. 1001, so that a limit of about 5 rad./sec. appears reasonable.)

(*b*) The centre of gravity of the aircraft is assumed to fall in a vertical path at the rate of 100 ft. per sec. (This is a round figure which appears a reasonable one for the type of spin considered, having regard to values quoted in R. & M. 1001.)

(*c*) The engine throttle is opened fully so that the airscrew forces are the static thrust and torque.

Under these conditions the following forces and couples will be brought into play.

(1) Forces on all masses corresponding to a normal acceleration of ng. (According to R. & M. 1001, n varies from 3 for slow spins to 1.2 for fast ones. A figure of 1.5 for the type of spin here considered appears, therefore, to cover extreme cases.)

(2) Centrifugal forces due to the rotation of the aircraft about its c.g.

(3) Gyroscopic couples induced by the rotation of the airscrew axis in the spin.

(4) Aerodynamic forces and couples acting on the airscrew as a result of its velocity in its own plane.

(5) Static thrust of airscrew.

(6) Torque of airscrew.

We are concerned here with the loads to which the engine mounting is subjected by the action of the above forces, and not with the manner in which these loads are distributed among the members of the structure. The design of the latter is, therefore, irrelevant to the present discussion. To fix ideas, assume the engine to be of the water-cooled V-type connected to the engine bearers by means of four "feet" in the usual manner.

The forces and couples above enumerated will now be discussed in the order given.

(1) Forces due to normal acceleration of 1·5g.

These are calculated in the ordinary way, forces equal to $1\frac{1}{2}$ times their weight acting vertically downwards on all components carried by the mounting.

(2) Centrifugal Forces.

These also are quite straightforward, each component being acted upon by a force equal to $\frac{w}{g}\, r\, \Omega^2$ lb., where

w = wt. of component in lb.
g = accel. due to gravity (= 32 ft. per sec.^{2}).
r = distance in feet of c.g. of component from a vertical axis through c.g. of aircraft.
Ω = rate of spin in rad./sec., here assumed equal to 5.0.

These forces act outwards from a vertical axis through the c.g. of the aircraft.

(3) Gyroscopic Couples.

These couples are due to the angular velocity of the axes of the rotating parts.

$$\text{Value of couple} = \frac{I\, \Omega\, \omega}{g} \text{ lb. ft., where}$$

I = moment of inertia of rotating part in lb. ft.^{2}
ω = revs. per sec. of rotating part multiplied by 2π.

In all cases it will be found that the I of the engine crankshaft is negligible compared with that of the airscrew. Also the I of a metal airscrew is usually much greater than that of a corresponding wooden one, so that if both types of airscrew are to be fitted, the I taken should be that of the metal one. The couple is a pitching couple, and its sense, *i.e.*, whether a stalling or a diving couple, is easily found from the rule that if the top of the airscrew, as seen by the pilot sitting behind it, is moving in the same direction as the spin (*e.g.*, if both are to port), the couple is a diving one; if in the opposite direction, it is a stalling couple.

It may be well to try the effect of each type in combination with the other forces, although usually the severest conditions are produced by the diving couple.

(4) Aerodynamic Forces and Moments due to velocity of airscrew in its own plane.*

The velocity of the airscrew in its own plane may be advantageously divided up into two parts:—

(*a*) That due to the downward vertical velocity of the whole aircraft.

(*b*) That produced by the spinning of the aircraft about its c.g.

The effects of these may be found separately and then added together. Because of its greater simplicity, take case (*a*) first.

Four-bladed airscrew.

(*a*) *Downward velocity.* Assume that, viewed from the pilot's seat, the airscrew is turning anticlockwise, so that, in conjunction with a left-hand spin, Case (3) gives a diving couple as explained above. There will be:—

i. *A vertical upward force*, due to the airscrew acting as a fin, of constant value equal to $\frac{1 \cdot 8v}{\pi r_1^2} \cdot \frac{Q}{n}$ where

v_0 is the downward velocity in ft. per sec. (100'/sec. taken).

* For a full theoretical discussion of these see R. & M. No. 427.

r_1 is the tip radius of the airscrew blades in feet.
Q is the static torque in lb. ft. of the airscrew.
n is the airscrew revs./sec.

This force acts at the airscrew hub, and is always opposite to the direction of motion considered.

ii. A constant yawing moment of $\frac{Tv_o}{2\pi n}$ lb. ft., where T is the static thrust of airscrew in lb. The sense of this moment is easily found from consideration of the direction of rotation of the blades relative to the downward velocity of the whole airscrew. In the present case, as viewed from the pilot's seat, the blades of the left half of the airscrew circle are travelling in the same direction as the dropping aircraft (see Fig. 1), and therefore against the relative wind. These blades will, therefore, have a greater air velocity and therefore a greater thrust than the corresponding blades on the right half of the circle. This produces a couple tending to turn the aircraft to starboard.

The effect of the sideways velocity of the airscrew due to the spinning of the aircraft about its c.g. is obtained in an exactly similar way. Since the aircraft is assumed spinning to the left, there is a relative wind to the right (these terms to be understood always as viewed by the pilot), and the fin effect gives a load to starboard of $\frac{1 \cdot 8\, v_o\, Q}{\pi r_1^2 n}$ where v_o this time is the sideways velocity given below.

blades are normal to the relative wind, *i.e.*, when they are horizontal (see Fig. 3). There are:—

i. A vertical force (fin effect) equal in value to the constant force assumed already found, and acting in the same direction. Call it F_1 lb.

In addition, there will be a relieving or downward inertia load on every component carried by the engine mounting of $\frac{F_1 w}{W}$ (where W = total weight of aircraft in lb.).

(*ii*) A yawing moment equal in value to the constant yawing moment and acting in the same direction, *i.e.*, to starboard. Call it M_1 lb. ft. In addition, there will be a relieving force and couple on every component, tending to turn the aircraft to port.

Value of such force $= \frac{M_1}{I_z} xw$ lb. where

x = distance of component in ft. forward of c.g. of aircraft.

I_z = yawing moment of inertia of whole aircraft about its c.g. in lb. ft.^{2}.

(If I_z is not known, a fairly good estimate is given by $I_z = 0.6\, W\left(\frac{s}{13 \cdot 5}\right)^2 g$ where s is the semi span in ft.)

Value of such relieving moment $= \frac{M_1 I_{cz}}{I_z}$, where I_{cz} is the yawing polar moment of inertia of the component. The I_{cz} for the airscrew may be taken to be its ordinary

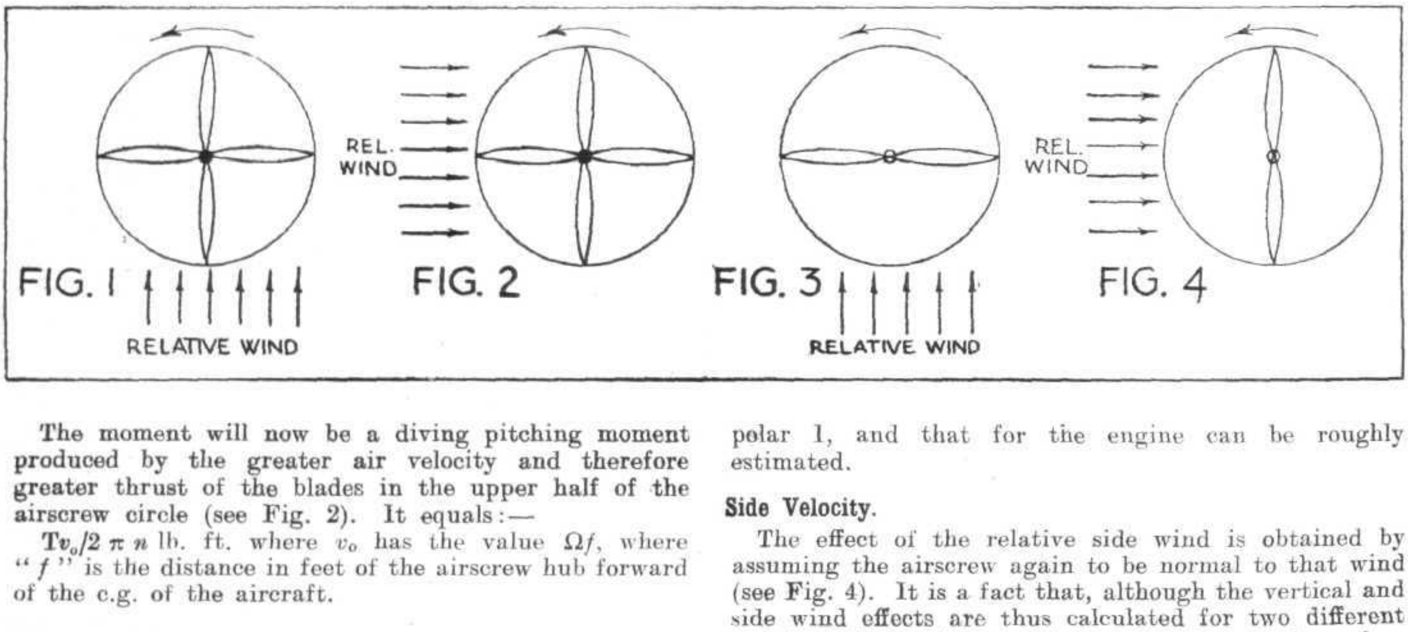


FIG. 1 FIG. 2 FIG. 3 FIG. 4
RELATIVE WIND RELATIVE WIND

The moment will now be a diving pitching moment produced by the greater air velocity and therefore greater thrust of the blades in the upper half of the airscrew circle (see Fig. 2). It equals:—

$Tv_o/2\pi n$ lb. ft. where v_o has the value Ωf, where "f" is the distance in feet of the airscrew hub forward of the c.g. of the aircraft.

Two-bladed airscrew.

Aircraft in which the forces considered here are important will rarely be fitted with four-bladed airscrews, and the latter has only been discussed because it forms a good introduction to the slightly more complicated case of the two-blader.

The element of complexity in the latter case is introduced by the fact that there are oscillating as well as constant forces acting simultaneously. Moreover, there are two kinds of oscillating forces, which are mutually exclusive, one occurring every time the blades are normal to the relative wind, and the other occurring when they are in the 45°, or diagonal position.

The constant forces and moments are found in exactly the same way as for the four-bladed airscrew already discussed. We shall, therefore, confine ourselves to the discussion of the oscillating forces and moments. A point to be noted is that, whereas the constant forces are resisted by aerodynamic forces on the wings and various control surfaces, the oscillating forces are resisted by inertia forces. As before, consider first the *Downward velocity* of 100 ft./sec. and take the set of oscillating forces and moments which occur when the

polar I, and that for the engine can be roughly estimated.

Side Velocity.

The effect of the relative side wind is obtained by assuming the airscrew again to be normal to that wind (see Fig. 4). It is a fact that, although the vertical and side wind effects are thus calculated for two different positions of the airscrew blades, these effects themselves are simultaneous and additive. In this instance the fin effect produces a force (call it F_2 lb.) to starboard equal in value to the constant force in the same direction, while the increased air speed of the upper blade gives a diving moment (call it M_2 lb. ft.), also equal to the constant diving moment.

Due to F_2 relieving force (to port) on each component $= \frac{F_2 w}{W}$ lb.

Due to M_2, relieving force (upward) in each component $= \frac{M_2 xw}{I_y}$ lb. ft. where I_y is the pitching moment of inertia of the aircraft in lb. ft.^{2}. I_y may be taken $= 0.4W\left(\frac{h}{13 \cdot 5}\right)^2 g$, where h = distance in ft. from c.g. of aircraft to mid chord of tail. Relieving moment (stalling) on each component $= \frac{M_2 I_{cy}}{I_y}$, where I_{cy} = pitching I of component.

(*Note.*—The relieving moment from the airscrew must be left out when dealing with side-velocity effect.)

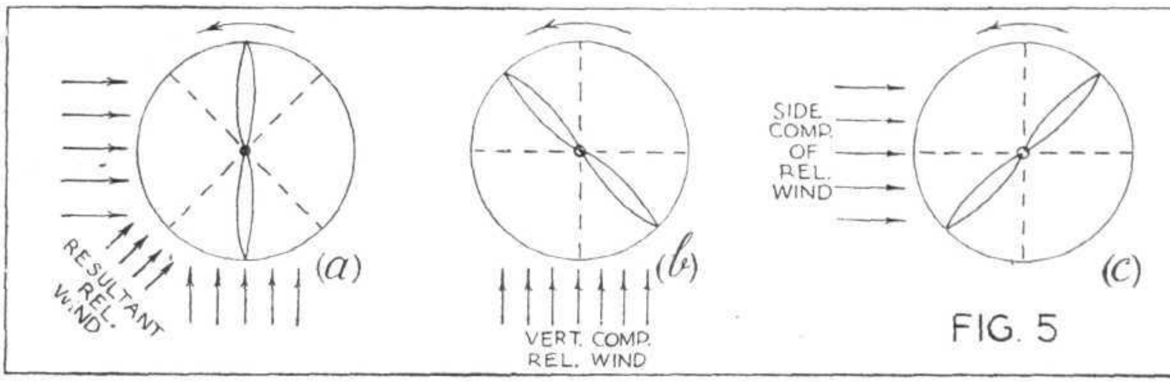


FIG. 5

The second set of oscillating forces occurs when the airscrew is in a diagonal position to the resultant relative wind, as in Fig. 5 (a). This set excludes the first set of oscillating forces, but does not exclude the constant forces.

The condition 5 (a) may be split up into conditions 5 (b) and 5 (c), the effects of which, when added together, give effect of condition 5 (a).

Take condition 5 (b) *first*.—This condition gives rise to a force and a moment. The upper blade having the greater air speed has the greater drag, and the excess drag has a component to the right (the upward component is already included in the constant forces). The force is, therefore, to starboard. Its numerical value is the same as that of the constant force for this condition, and therefore equal to the upward force in the first set of oscillating forces, *i.e.*, F_1. The relieving forces will also have the same numerical values as before, and will, of course, be to port.

Similarly, the moment $= M_1$. Owing to the greater air speed of the upper blade it develops an extra thrust, which makes M_1 a diving moment. (This thrust also produces a component yawing moment, but this is included among the constant moments.) The value of the relieving (or upward) force for each component due to $M_1 = \frac{M_1 xw}{I_y}$.

Value of relieving (or stalling moment) $= \frac{M_1 I_{cy}}{I_y}$.

Condition 5 (c) in the same way gives a force and a moment of F_2 and M_2, respectively, F_2 being a downward force and M_2 a yawing moment to port.

Due to F_2—

Relieving force on each component $= \frac{F_2 w}{W}$ lb. upward.

Due to M_2—

Relieving force $= \frac{M_2 xw}{I_z}$ to starboard for each component.

Relieving moment $= \frac{M_2 I_{cz}}{I_z}$ to starboard for each component except airscrew.

If, with the same relative wind directions, the airscrew is assumed in the other diagonal position, perpendicular to the first, all forces and moments will be reversed. The position which gives the most severe resultant condition should, of course, be chosen. As the two sets of oscillating forces are mutually exclusive, that set should be chosen which produces the heaviest loads in conjunction with forces (1), (2), (3), (5) and (6).

(5) **Static thrust of airscrew.**

This is found in the ordinary way and may be assumed unaffected by the variation of velocity of the blades in the plane of the screw due to the relative wind in that plane.

(6) **Torque of airscrew.**

Remarks under (5) above apply.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

THE FLUTTER OF MONOPLANES, BIPLANES AND TAIL UNITS. By R. A. Frazer, B.A., B.Sc., and W. J. Duncan, D.Sc., A.M.I.Mech.E. R. & M. No. 1255 (Ae. 404). (179 pages and 41 diagrams.) January, 1931. Price 7s. 6d. net.

This report is the second in the Monograph series of the Aeronautical Research Committee to be devoted to the subject of flutter. The first of these, R. & M. 1155, appeared in 1928 and was entitled "The Flutter of Aeroplane Wings"; it contained a tolerably general theory of flutter, but the problem discussed in detail was the prevention of the wing flutter of monoplanes. In the present report, which is to be regarded as a sequel to R. & M. 1155, an account is given of all the more recent work on flutter carried out at the National Physical Laboratory, the subject of airscrew flutter being, however, excluded. The contents are sufficiently indicated by the chapter headings, namely:—"Wing Flutter as Influenced by the Mobility of the Fuselage"; "Conditions for the Prevention of Flexural-Torsional Flutter of an Elastic Wing"; "The Wing Flutter of Biplanes"; "The Flutter of Aeroplane Tails"; "Tail Flutter of a Particular Aeroplane." All of these chapters have already been issued separately in the R. & M. Series, but it has been considered desirable to re-issue them in a collected form, with certain minor additions and improvements. The compilation includes the design recommendations regarding the prevention of flutter of the wings of biplanes and of tail units in general.

A special feature is an entirely new introductory chapter which has been written expressly to provide a really elementary account of the theory of wing flutter and tail flutter. The theory is approached by an account of a series of experiments on models; these experiments are freely illustrated by photographs and by reproductions of cinematograph films.

THE INFLUENCE OF A FUSELAGE ON THE LIFT OF A MONOPLANE. By A. S. Hartshorn, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1344 (Ae. 476). (15 pages and 10 diagrams.) May, 1930. Price 9d. net.

It has been found by model tests that the lift of a combination of an aeroplane body and a wing is not in general equal to the sum of the lifts of the two components when tested separately. This difference is broadly referred to as an interference effect and is dependent on a number of factors which can be generalised into three groups:—(a) The aerodynamic characteristics of the aerofoil, (b) the aerodynamic characteristics of the body, (c) the position of the aerofoil relative to the body.

The available model and full scale results for monoplanes have been examined, special attention being paid to the maximum lift attainable. Both model and full scale results suggest that the position of the body relative to the wing has a large influence on the maximum lift attainable. With the wing flush with the top of the body the maximum lift is practically equal to that of a continuous aerofoil. As the wing approaches the under-surface of the body the spoiling effect is increased and is modified to an increasing extent by the aerofoil characteristics, a thick wing section giving the worst interference. Model results suggest that the body shape has a large influence on the interference effect, being most beneficial with a deep cabin type, but there is not sufficient information to provide a simple rule for estimating the magnitude of the influence of the body shape.

The interference of a biplane combination appears to be more complex, and it is hoped to collect the available information at a later date.

HEAT TRANSMISSION BETWEEN SURFACES AND FLUIDS FLOWING OVER THEM. (1) THE CASE OF TWO-DIMENSIONAL FLOW. By W. F. Cope, B.A. R. & M.

No. 1359 (Ae. 490). (8 pages and 2 diagrams.) October, 1930. Price 6d. net.

All the experiments were made with air preheated in a gas furnace and forced at high speeds through the experimental tube which was cooled by a water jacket. In order to compare the three-dimensional case with the two-dimensional one, the first series of observations was made in a pipe 1 in. in diameter. Subsequently, pipes of internal sections 1 in. by 0·125-in. and 2 in. by 0·1-in., were tested.

The results of the three-dimensional experiment were in fair agreement with previous work on the subject, in showing an appreciably greater rate of heat transmission than that calculated from the Reynolds theory. The results obtained from the rectangular pipes show that as the flow becomes more two-dimensional in character the ratio of the observed heat transmission to the calculated transmission becomes progressively smaller and considerably less than unity.

THE 5-FT. OPEN JET WIND TUNNEL, R.A.E. By F. B. Bradfield, Math. and Nat. Sci. Triposes. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1364. (Ae. 492.) (11 pages and 11 diagrams.) November, 1930. Price 1s. net.

An open jet tunnel with enclosed return passage has been installed at the Royal Aircraft Establishment in the building previously occupied by the 4-ft. closed tunnel. The design, which is largely due to Mr. R. McKinnon Wood, has been based upon the Göttingen tunnel, but is more compactly arranged.

The open jet is of 5 ft. diameter, and is 9 ft. long. The maximum wind speed with a 50-h.p. motor overloaded 60 per cent. is 170 ft./sec., so that it is the highest speed tunnel at the R.A.E., the top speed hitherto available being 140 ft./sec. The structure has been designed to stand greater pressures, so that if a larger motor were substituted for the 50-h.p. motor, it might be possible to use the tunnel up to 350 ft./sec. This tunnel thus forms a valuable extension to the plant. The power factor for the tunnel is exceptionally low the value of $\frac{\text{h.p.} \times 550}{\frac{1}{2}\rho A V^3}$ being 0·38, with a fan efficiency of about 90 per cent. With a 50-h.p. motor overloaded 60 per cent., the wind speed is 170 ft./sec.

The tunnel has been made very compact, so as to keep the building costs of the 24-ft. tunnel, of which it is a model, as low as possible; the expansion ratio of the tunnel is consequently only $3\frac{1}{4}:1$. The velocity in the jet varies by $\pm 1\frac{1}{2}$ per cent. from the mean over the central 4 ft. diameter of the jet, without any honeycomb. If necessary this may be improved by using a screen of wire gauze.

THE LIMITS OF COMPRESSION RATIO IN DIESEL ENGINES. By D. R. Pye, M.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1365 (E. 45). (9 pages and 3 diagrams.) November, 1930. Price 9d. net.

Although the place of compression ratio in the functioning of a petrol engine is now well understood, there is no general concensus of opinion as to the limit to which compression ratio in the high compression injected fuel engine can usefully be raised. In the following report an endeavour is made to decide this question.

Results obtained in experimental compression ignition engines of 12 and 15 : 1 compression ratio are given, and these are compared with the calculated efficiency of theoretical cycles of compression ratio between 10 and 20 : 1, in which a limit is placed upon the maximum pressure to be allowed in the cylinder.

It is concluded that there is experimental evidence that substantial gains of economy may be achieved by a raising of the compression ratio to 15 : 1 provided difficulties of design in regard to the shape of the combustion chamber can be got over; but that an examination of the theoretical cycles makes it appear unlikely that any advantage would be obtained by raising the compression ratio further, so long as maximum cylinder pressures are limited to about 900 lb. per sq. in.

DRAG AND HEAT DISSIPATION OF THREE RADIATOR SYSTEMS. By E. T. Jones, M.Eng. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1366 (Ae. 493). (14 pages and 12 diagrams.) August, 1930. Price 1s. net.

The heat dissipation and the drag of unshuttered radiators and radiators fitted with flat and conical shutters have been measured in the wind tunnel. Some uncertainty remains owing to the possibility of interference between radiators and the aeroplane, and experiments have now been made to determine the change of performance of an aeroplane with a radiator fitted with different fairings and shutters and operating at the same cooling capacity.

The level speed and maximum rate of climb of a Fairey "Fox" aeroplane were measured with three radiator systems adjusted to give, in turn, their maximum and minimum cooling. The cooling capacity of each radiator system has also been determined, and the performance results interpolated at the same radiator and air temperatures.

The drag of each radiator has been deduced from the performance results, and is compared qualitatively with the wind tunnel results.

The top speed and maximum rate of climb of the aeroplane at an aneroid height of 5,000 ft. when fitted with the radiator systems adjusted to give the same inlet temperature (90° C.) when operating in the maximum English summer temperature (14·6° C.) are compared. An analysis of the wind tunnel results places the radiators in the same order of merit as in the full scale tests; namely, without a radiator with a retractable radiator, with a faired underslung radiator, and with an unfaired underslung radiator. The virtual drag of the exposed radiator unshuttered and unfaired is proportional to the area exposed, and is approximately 15 per cent. greater than the free drag measured in the wind tunnel.

QUANTITATIVE MEASUREMENTS OF THE LONGITUDINAL CONTROL AND STABILITY OF THE BRISTOL FIGHTER WHEN STALLED, WITH REFERENCE TO STALLED LANDINGS. By E. T. Jones, M.Eng., and R. P. Alston, B.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1367 (Ae. 494). (8 pages and 13 diagrams.) September, 1930. Price 9*d*. net.

The possibility of utilising the stalled glide on to the ground for an emergency landing, where there may not be room to flatten out and a small horizontal velocity is essential, has long been mooted. The development of the slotted wing has made the idea more feasible in two ways:—(*a*) It is possible by slotting a wing along its whole length to increase the maximum lift by at least 50 per cent. without altering the gliding angle much at the stall, so that the stalled horizontal and vertical velocities can be reduced by 25 per cent. (*b*) Auto control slots at the wing tips, working in conjunction with some form of spoiler device connected to the aileron, provide a sufficient amount of lateral stability and control. Quantitative experiments have accordingly been made on a Bristol Fighter aeroplane to determine the degree of longitudinal control and stability at high incidence in order to obtain data relevant to landing from stalled glides.

A unique trimming curve is obtained from a definite C.G. position up to the highest incidence that can be maintained, and there is no evidence of failure of the elevator control.

The power of the longitudinal control up to the highest incidence is adequate to neutralise the maximum rate of pitch obtained during bumpy atmospheric conditions. Small incidence changes beyond stalling incidence can be effected fairly quickly, but to change from a fully stalled to a slightly unstalled glide (24° to 16·5°) takes about 30 sec., and the aircraft loses about 500 ft. before the motion becomes steady at the new incidence.

A visual elevator angle indicator is of considerable assistance to the pilot when flying stalled, and it is suggested that such an indicator graduated in ft./sec. would enable a pilot to fly steadily in the stalled state at a desired rate of descent.

A good degree of longitudinal stability is shown at all incidences beyond the peak of the lift curve. Stalled glides could be made right down to the ground in fairly calm atmospheric conditions, and a safe landing made, provided the undercarriage and tail skid were sufficiently robust to withstand a vertical velocity of 10 per cent. above the mean fully stalled rate of descent.

FURTHER EXPERIMENTS ON THE FLOW AROUND A CIRCULAR CYLINDER. By A. Fage, A.R.C.Sc., and V. M. Falkner, B.Sc. R. & M. No. 1369 (Ae. 496). (13 pages and 11 diagrams.) February, 1931. Price 1s. net.

In an earlier paper, R. & M. 1179,* an examination of the airflow in the boundary layer around a circular cylinder near the region where the separation from the surface took place was made from observations of total head taken with a small exploring tube. The types of flow considered were those associated with the large change of K_D which occurs at high values of Reynolds number (V_0D/ν). An analysis of these experimental results showed that there was a critical point on the cylinder, just beyond the region of maximum negative pressure, where a transition from laminar to turbulent flow in the boundary layer began, and that the position of this point on the cylinder was indicated by a pronounced inflexion in the curve of normal pressure. In a later paper, R. & M. 1231,† an attempt was made to determine from the experimental data given in the earlier paper, the intensity of friction on a limited part of the surface of the cylinder anterior to the region of maximum negative pressure. Since the publication of these two papers an experimental method of measuring the friction on the surface of a body immersed in an air stream from observations of velocity taken with exceedingly small surface tubes has been developed and tested on a large metal aerofoil.‡ This method was found to be reliable.

The character of the frictional distribution depends on the value of (VD/ν). At a relatively low value of (VD/ν), the frictional intensity rises gradually to a maximum value and then rapidly falls to a zero value; whereas at a larger value of (VD/ν) within the sensitive range the frictional intensity after reaching its maximum value falls less abruptly to a minimum value, and then rises to a second maximum before the zero value is reached. A transition from laminar to turbulent flow occurs in the boundary layer where the frictional intensity is a minimum. The transition region is also clearly indicated by a marked inflexion in the curve of pressure distribution.

The frictional distribution measured on the 5·89-in. cylinder is in reasonably close agreement with that predicted by modern boundary layer theory. Experiments have also been made to determine the effect of disturbances in the general stream on the characteristics of the flow.

* R. & M. 1179. "The Airflow Around a Circular Cylinder in the Region where the Boundary Layer Separates from the Surface." A Fage.
† R. & M. 1231. "The Skin Friction on a Circular Cylinder." A Fage.
‡ R. & M. 1315. "An Experimental Determination of the Intensity of Friction on the Surface of an Aerofoil." Fage and Falkner.

THE DRAG OF CIRCULAR CYLINDERS AND SPHERES AT HIGH VALUES OF REYNOLDS NUMBER. By A. Fage, A.R.C.Sc. R. & M. No. 1370 (Ae. 497). (6 pages and 2 diagrams.) May, 1930. Price 6d. net.

The paper gives the results of experiments made recently to measure the drag of a circular cylinder of large diameter (23 in.). The more important measurements made in this country and abroad* of the drags of circular cylinders and spheres at high values of Reynolds number are also included. An analysis of these measurements leads to the conclusion that the flow in an open jet tunnel of the Göttingen type, with a contracting mouth and with the honeycomb at the larger end, is steadier than that in an N.P.L. type of tunnel.

The drag coefficients of a circular cylinder and of a sphere appear to be slowly increasing, at the highest values of Reynolds number attained.

* See Prandtl, Göttingen, Nachrichten Math. Phys., 1914. Pannell' R. & M. 190. Bacon and Reid, N.A.C.A. Report 185. Jacobs, N.A.C.A. Technical Note 312. Flachsbart, Phys. Zeit., July, 1927. Dryden and Kuethe, N.A.C.A. Report No. 342.

THE VALIDITY OF DRAG TESTS ON A LARGE SCALE MODEL IN A SMALL CLOSED WIND TUNNEL. DRAG OF 1/5TH SCALE NACELLE INSTALLED ON THE UPPER SURFACE OF A MONOPLANE. By F. B. Bradfield, Math. & Nat. Sci. Triposes, and W. G. A. Perring, R.N.C.

Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1371 (Ae. 498). (11 pages and 10 diagrams.) November, 1930. Price 9d. net.

The purpose of the investigation was to find whether the drag of a 10-in. diameter nacelle, mounted on a wing of 2·14 ft. chord, can be correctly measured in a 4-ft. tunnel to check a test by Messrs. Boulton and Paul in a 4-ft. tunnel of a ¦th scale nacelle housing a Jupiter XF engine on a wing of 2·14 ft. chord and 3·5 ft. span by tests in a 7-ft. tunnel at the R.A.E.

Lift and drag have been measured on :—(1) Aerofoil alone. (2) Nacelle alone, with and without a Townend ring. (3) Nacelle on aerofoil, with and without Townend ring. Two series of tests were made, with a 5-ft. length of wing, and with a wing of infinite aspect ratio. This latter case was represented by filling the gap between the aerofoil and the wall by lengths of aerofoil carried from the wall and separated from the central aerofoil by a very small gap.

The measured drag results are applicable to the complete aeroplane when the "local" lift coefficient of the wing adjacent to the nacelle is the same in the two cases. It is preferable to carry the model wing right across the tunnel, so that the flow is two dimensional and no doubt as to the lift coefficient at the centre of the wing is introduced by the tunnel constraint. The same value of nacelle drag against local lift coefficient is obtained with the infinite wing and with No. 5 ft. wing in the 7 ft. tunnel, but the agreement is less good with the 3½-ft. wing in the 4 ft. tunnel, indicating that the model tunnel size ratio is getting too large to calculate the relevant tunnel corrections.

The effect of the Townend ring is large, the nacelle drag being reduced from 82 to 22 lb. full scale at 100 ft./sec. when $k_L = 0 \cdot 1$. The drag of the uncowled nacelle seems high.

THE STRENGTH AND POSITION OF THE EDDIES BEHIND A CIRCULAR CYLINDER. By A. Thom, D.Sc., Ph.D., A.R.T.C., Carnegie Teaching Fellow, University of Glasgow. Presented by Professor J. D. Cormack. R. & M. No. 1373 (Ae. 500). (8 pages and 10 diagrams.) December, 1930. Price 6d.

A cylinder suspended transversely in a moving fluid can be made to oscillate continuously if the natural frequency of the suspended cylinder is the same as that of the eddies which are known to be given off by a cylinder at nearly all values of Reynolds number. This phenomenon provides a method of measuring the frequency of these eddies and of estimating the strength of the impulse given to the cylinder.

The present paper deals with measurements carried down to the lowest value of Reynolds number at which eddies exist. It is shown that the impulse decreases with decreasing speed until it becomes zero at the Reynolds number where eddying stops.

AN INVESTIGATION OF A POSSIBLE CAUSE OF AIRCRAFT FIRES ON CRASH. By W. G. Glendinning, B.A., B.Sc., with an Appendix by Staff of the Engine and Electrical Department, R.A.E. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1375 (E. 47). (19 pages and 8 diagrams.) January, 1930. Price 1s. net.

One of the possible causes of aircraft fires on crash is the ignition of petrol or lubricating oil by contact with hot exhaust pipes.

Various observers have carried out determinations of the minimum temperature of an exhaust pipe, which will cause ignition of petrol or oil in contact with the outer surface of the pipe under conditions likely to occur on crash, and it has been stated that to obtain complete immunity from a hot exhaust pipe, it is necessary to keep the temperature of the pipe down to 350° C. (R. & M. 795.*)

It was thought probable, however, that conditions more favourable to the ignition of petrol or oil might exist in the interior of an exhaust pipe, and it was decided to carry out tests to find the minimum temperatures at which petrol oil will ignite inside exhaust pipes and to study the action of the various factors which affect the minimum temperatures of ignition.

It was found that petrol would explode after a lag period of about 10 minutes, when introduced into a steel vessel filled with air and kept at 235° C.

In an exhaust pipe, into which petrol was introduced while the pipe was cooling, the lowest temperature (measured at the time of introduction) which caused ignition to occur was 280° C., the lag period at this temperature being about 10-20 seconds. With higher temperatures the lag period was shorter, and at 350° explosion followed the introduction of the petrol almost instantaneously.

The risk is less from lubricating oil, as its minimum igniting temperature is about 50° higher than that of petrol.

* R. & M. 795.—The prevention of fire in single-engined aeroplanes.

SOME CASES OF FLOW OF COMPRESSIBLE FLUIDS. By Professor G. I. Taylor, F.R.S. R. & M. No. 1382 (Ae. 507). (16 pages and 5 diagrams.) February, 1930. Price 1s. net.

In previous reports I have shown that when a body moves through the air at a speed less than, but comparable with, that of sound, irrotational motion ceases to be possible as soon as the speed of the body relative to still air attains some definite value which is always less than that of sound, but depends on the shape of the body. The greatest speed at which irrotational motion is possible seems in the cases so far examined to be determined by the rule that the greatest speed at the surface of the body is equal to, or slightly greater than, that of sound; but the mechanical method in one case and the approximate method in another which were used in obtaining the solutions are not capable of determining accurately whether or not the real criterion is the first attainment of the velocity of sound at some point in the field.

The essential difference between two cases previously treated by the same author is that in the first the velocity has a maximum value in the constriction, so that the pressure gradient is at right angles to the surface at the point of minimum pressure, whereas in the second the speed increases and the pressure decreases continuously along all stream lines.

At first sight, one might suppose therefore that this is the condition which differentiates between cases where the speed of sound may be attained and exceeded in a regular manner and cases where the speed of sound is the maximum which can be attained in irrotational motion (if, indeed, there are such cases). In the work which follows this hypothesis is tested and proved to be untrue by finding cases in which the speed of sound is attained and exceeded in a regular manner in the region where the velocity of flow is a maximum.

The analysis leads to the prediction that a rapid thickening of the boundary layer might occur when the speed of sound is attained, and this hypothesis is shown to fit in with the existing experimental knowledge of the subject.

TESTS OF VARIOUS LATERAL CONTROLS FITTED TO A SISKIN AIRCRAFT. By W. G. Jennings, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1384 (Ae. 509). (10 pages and 43 diagrams.) December, 1930. Price 9d. net.

Wing-tip automatic slots have proved an effective device for providing increased lateral stability at the stall, and many service aircraft of the two-seater and larger types have been fitted with this device. In the case of single-seater fighter aircraft, where manœuvrability is of primary importance, it is desirable that adequate control at the stall should also be provided, and the plain automatic slot does not, in general, supply this need. Certain aircraft fitted with the interconnected slot and aileron-type control have shown satisfactory control characteristics at the stall but little or no increase in stability.

A proposal to combine the automatic slot with a device connected to the aileron for spoiling the slot in front of the raised aileron appeared to provide a promising method for giving both stability and control at the stall.

A method due to Mr. McKinnon Wood, for spoiling the action of the slot, is described in R. & M. 1260.* This device is hereafter referred to as the "spoiled autoslot." Another method, due to Messrs. Handley Page, Ltd., consists of a plate projecting from the main wing behind the slat and connected to the ailerons in such a manner that it comes into operation only as the aileron is raised. This device is known as the "interceptor autoslot," and is described in greater detail later.

In normal flight none of the various controls which were tried differed appreciably from that of the standard aircraft. In all cases the side-slipping qualities were poor, and the interceptor autoslot was worst in this respect.

At the stall the interceptor autoslot was distinctly superior to all the other types. With the control column central the aircraft was very stable, and when disturbed a dropped wing could be raised with ease, even against the rudder.

When fitted with the plain autoslot, "spoiled" autoslot and interceptor autoslot, the aircraft could not be made to spin.

* R. & M. 1260. Flight tests on an Atlas fitted with automatic slots connected with the ailerons.—E. T. Jones.

THE MODE OF DEFORMATION OF A SINGLE CRYSTAL OF SILVER. By H. J. Gough, D.Sc., and H. L. Cox, B.A. R. & M. No. 1385 (M. 70). (13 pages and 14 diagrams.) June, 1930. Price 1s. net.

During a series of experiments on the behaviour of single crystals of zinc and antimony under alternating torsional stresses*†‡ some information was obtained as to the mode of formation of mechanical twins. From the results of the work on zinc,*† it appeared that the formation of twins depended to a large extent on the slip system, and the actual planes on which twins were formed at any point were found to depend simply upon the direction of slip at that point.

The present experiment on a single crystal of silver was undertaken with the object of investigating the twinning characteristics of the metal. A secondary object of the work was to investigate the slip phenomena.

The observed slip phenomena were found to be in close accordance with the distribution anticipated on the basis of the maximum resolved shear-stress law. In addition, the slip-band spacing (number of bands per unit distance transverse to their length) was examined, and it was concluded that this spacing varies systematically with the intensity of resolved shear stress.

No definite twins were observed, and it is concluded that twinning did not occur under the conditions of the tests.

Failure in torsional fatigue occurred by the formation of a crack after $2 \cdot 4 \times 10^6$ reversals of $\pm 2 \cdot 0$ tons/in.² nominal maximum shear stress, following a small number of cycles of smaller stress ranges. The crack as a whole tended to follow the direction of maximum resolved shear stress (*i.e.*, the circumferential direction); but small portions of the crack tended to follow the edges of the slip planes, especially in those regions where the operative slip plane changed.

Since no twins were observed, the experiment must be regarded as having failed in its main object. That definite twins were not produced was surprising, and a second single crystal of silver is in hand, and this will be tested under alternating direct stresses.

* R. & M. 1183. The behaviour of a single crystal of zinc subjected to alternating torsional stresses.—Gough and Cox.

† R. & M. 1322. Further experiments on the behaviour of single crystals of zinc subjected to alternating torsional stresses.—Gough and Cox.

‡ R. & M. 1323. The behaviour of a single crystal of antimony subjected to alternating torsional stresses.—Gough and Cox.

THE INFLUENCE OF TITANIUM TETRACHLORIDE ON THE GAS CONTENT AND GRAIN SIZE OF ALUMINIUM AND SOME ALLOYS. By Dr. W. Rosenhain, F.R.S., J. D. Grogan, B.A., and T. H. Schofield, M.Sc. Work performed for the Department of Scientific and Industrial Research. R. & M. No. 1386 (M. 71). (10 pages and 16 diagrams.) November, 1929. Price 1s. net.

It has recently been shown by D. J. Tullis* that dissolved gas may be removed rapidly and very completely from some of the alloys of aluminium by passing chlorine gas through the molten metal. Castings made from metal so treated are surprisingly free from gas cavities, but are very coarse in grain size. If the treated metal, while still molten, is further treated with a mixture of chlorine and boron trichloride, the castings obtained are very sound and also very fine in structure. This refinement of grain size is said to persist after repeated remelting.

* J. Inst. Met. XL., 1928 (2), pp. 55-61.

Titanium tetrachloride when passed into molten aluminium appears to behave in the same way as chlorine and boron trichloride. The following main conclusions have been reached as to its behaviour:—

(1) It reduces the grain size of castings of aluminium. (2) It does not appear to alter the eutectic structure inside the crystal. (3) The reduction in grain size persists after remelting even if the molten metal is heated to 780° C. (4) It removes gases from, reduces the grain size of, and does not "modify" the 12 per cent. silicon alloy. (5) It improves the soundness of cast Y-alloy and decreases the grain size of the cast material. (6) By yielding sound material, of fine grain, it enables cast slabs of Y-alloy 1½-in. thick to be rolled without the employment of the usual preliminary forging operation.

(7) The fine grain produced in Y-alloy by the action of titanium tetrachloride is likely to prove of value both in the production of large sound ingots for rolling into bars and sections and for the production of large forgings.

GAS REMOVAL AND GRAIN REFINEMENT OF ALUMINIUM ALLOYS. By Dr. W. Rosenhain, F.R.S., J. D. Grogan, B.A., and T. H. Schofield, M.Sc. Work performed for the Department of Scientific and Industrial Research. R. & M. No. 1387 (M. 72). (8 pages and 6 diagrams.) January, 1930. Price 9d. net.

Recent developments in the treatment of aluminium and some of its alloys for the removal of gas were stimulated first by the work of Archbutt on "pre-solidification" and by Rosenhain's method of passing nitrogen through the molten metal. This has since been developed by Tullis who has investigated the use of chlorine and developed the use of a volatile chloride-boron trichloride.

In the previous report* it was shown that titanium tetrachloride acted as an effective agent both for gas removal and for grain refinement. In this report it is shown that these properties are independent. Many chlorides possess the property of removing gas without causing grain refinement, while titanium aluminium alloy, made by the thermit process, causes grain refinement when added to the aluminium, but without removing gas. It appears probable that the vapour produced by the material added acts as the gas-removing agent, while certain specific elements have the power to cause grain refinement.

All the following materials were effective in removal of gases from molten silicon aluminium alloy:—(i) Carbon tetrachloride; (ii) silicon tetrachloride; (iii) tin tetrachloride; (iv) aluminium chloride; (v) ferric chloride; and (vi) tetrachlorethane.

The efficiency of gas removal appears to depend on the material employed for the purpose as well as on the quantity employed. For instance, titanium tetrachloride appears to be more efficient than silicon tetrachloride, which, in turn, appears to be more efficient than carbon tetrachloride. None of these materials cause exaggerated grain growth in silicon aluminium alloy.

All of the materials, except possibly titanium tetrachloride, cause a very definite coarsening of the eutectic structure by removing any tendency to "self-modification" present in the untreated alloy.

Of the materials examined only titanium tetrachloride and tin tetrachloride produce definite grain refinement (*i.e.*, a more fine-grained macro-structure). Titanium introduced as titanium aluminium alloy produces grain refinement in aluminium.

Thorium, a metal of the group which contains titanium and tin does not produce grain refinement when introduced in the form of thorium-aluminium alloy.

* R. & M. 1386. The influence of titanium tetrachloride on the gas content and grain size of aluminium and some alloys. Rosenhain, Grogan and Schofield.

SUMMARIES OF N.A.C.A. TECHNICAL REPORTS

The National Advisory Committee for Aeronautics is the American equivalent of our Aeronautical Research Committee, with headquarters at Washington, D.C. The Technical Reports issued by the N.A.C.A. are obtainable from the Superintendent of Documents, Washington, D.C., U.S.A. In the summaries printed below the prices of Reports are given. These prices are net, and a small amount should be added to cover postage. For the guidance of potential purchasers it may be pointed out that the Reports rarely exceed 5 oz. in weight.

No. 368. A NEW CHART FOR ESTIMATING THE ABSOLUTE CEILING OF AN AEROPLANE. By Walter S. Diehl. Price 10 cents.

This report, which was prepared for publication by the National Advisory Committee for Aeronautics, is concerned with the derivation of a chart for estimating the absolute ceiling of an aeroplane. This chart may be used in conjunction with the usual curves of power required and power available as an accurate substitute for extended calculation, or it may be used in the estimation of absolute ceiling when power curves are not available.

No. 369. MANŒUVRABILITY INVESTIGATION OF THE F6C-3 AEROPLANE WITH SPECIAL FLIGHT INSTRUMENTS. By C. H. Dearborn and H. W. Kirschbaum. Price 15 cents.

This investigation was made for the purpose of obtaining information on the manœuvrability of the F6C-3 fighter aeroplane. The tests were conducted by the National Advisory Committee for Aeronautics at Langley Field, Va., at the request of the Bureau of Aeronautics, Navy Department. It is the first in a series of similar investigations to be conducted on a number of military aeroplanes for the purpose of comparing the abilities of these aeroplanes to manœuvre, and also to establish a fund of quantitative data which may be used in formulating standards of comparison for rating the manœuvrability of any aeroplane. A large part of this initial investigation was necessarily devoted to the development and trial of methods suitable for use in subsequent investigations of this nature.

Air speed, angular velocity, linear acceleration, and position of the control surfaces were measured by instruments in the aeroplane during loops, push-downs, pull-outs from dives, pull-ups from level flight, barrel rolls, and spins. The co-ordinates of the flight paths were deduced from the data whenever possible, and were checked in some cases by the use of a camera obscura. The results are given in curves showing the variation of the measured quantities with respect to time, and maximum values are tabulated.

No. 370. EFFECT OF VARIATION OF CHORD AND SPAN OF AILERONS ON HINGE MOMENTS AT SEVERAL ANGLES OF PITCH. By B. H. Monish. Price 10 cents.

This report presents the results of an investigation of the hinge moments of ailerons of various chords and spans on two aerofoils having the Clark Y and U.S.A. 27 wing sections, supplementing the investigations described in References 1 and 2, of the rolling and yawing moments due to similar ailerons on these two aerofoil sections. The measurements were made at various angles of pitch, but at zero angle of roll and yaw, the wing chord being set at an angle of + 4° to the fuselage axis. In the case of the Clark Y aerofoils the measurements have been extended to a pitch angle of 40°, using ailerons of span equal to 67 per cent. of the wing semispan and chord equal to 20 and 30 per cent. of the wing chord.

The work was done in the 10-foot tunnel of the Bureau of Standards on models of 60-inch span and 10-inch chord, having square tips, no taper in plan form or thickness, zero dihedral, and zero sweepback.

No. 373. COEFFICIENTS OF DISCHARGE OF FUEL INJECTION NOZZLES FOR COMPRESSION-IGNITION ENGINES. By A. G. Gelalles. Price 10 cents.

This report presents the results of an investigation to determine the coefficients of discharge of nozzles with small, round orifices of the sizes used with high-speed compression-ignition engines. The injection pressures and chamber back pressures employed were comparable to those existing in compression-ignition engines during injection. The construction of the nozzles was varied to determine the effect of the nozzle design on the coefficient. Tests were also made with the nozzles assembled in an automatic injection valve, both with a plain and with a helically grooved stem. It was found that a smooth passage before the orifice is requisite for high flow efficiency. A bevelled leading edge before the orifice gave a higher coefficient of discharge than a rounded edge. Varying the length-diameter ratio from 1 to 3 for one of the orifices having a bevelled leading edge was found to have no effect on the value of the coefficient. The results with the nozzles assembled in an automatic injection valve having a plain stem duplicated those with the nozzles assembled at the end of a straight tube of constant diameter. Lower coefficients were obtained with the nozzles assembled in an injection valve having a helically-grooved stem. When the coefficients of nozzles of any one geometrical shape were plotted against values of corresponding Reynolds Numbers for the orifice diameters and rates of flow tested, it was found that experimental points were distributed along a single curve.

No. 374. THE AUTOMOTIVE IGNITION COIL. By T. H. Darnell. Price 25 cents.

This paper, which was submitted by the Bureau of Standards for publication, gives the results of an extensive series of measurements on the secondary voltage induced in an ignition coil of typical construction under a variety of operating conditions. These results show that the theoretical predictions hitherto made as to the behaviour of this type of apparatus are in satisfactory agreement with the observed facts. The large mass of data obtained is here published both for the use of other investigators who may wish to compare them with other theoretical predictions and for the use of automotive engineers who will here find definite experimental results showing the effect of secondary capacity and resistance on the crest voltage produced by ignition apparatus.

No. 375. FULL-SCALE TESTS OF METAL PROPELLERS AT HIGH TIP SPEEDS. By Donald H. Wood. Price 15 cents.

This report describes tests of 10 full-scale metal propellers of several thickness ratios at various tip speeds up to 1,350 feet per second. The tests were made in the Propeller Research Tunnel of the National Advisory Committee for Aeronautics at Langley Field, Virginia. The results indicate no loss of efficiency up to tip speeds of approximately 1,000 feet per second. Above this tip speed the loss is at a rate of about 10 per cent. per 100 feet per second increase relative to the efficiency at the lower speeds for propellers of pitch diameter ratios 0·3 to 0·4. Propellers having sections of small thickness ratio can be run at slightly higher speeds than thick ones before beginning to lose efficiency.

No. 376. SOME APPROXIMATE EQUATIONS FOR THE STANDARD ATMOSPHERE. By Walter S. Diehl. Price 10 cents.

This report, which was prepared for publication by the National Advisory Committee for Aeronautics, contains the derivation of a series of single approximate equations for density ratios $\frac{\rho}{\rho_o}$, $\frac{\rho_o}{\rho}$, $\sqrt{\frac{\rho_o}{\rho}}$ and for the pressure ratio $\frac{p}{p_o}$, in the standard atmosphere. The accuracy of the various equations is discussed, and the limits of applications are given. Several of these equations are in excellent agreement with the standard values.

No. 377. A METHOD OF FLIGHT MEASUREMENT OF SPINS. By Hartley A. Soulé and Nathan F. Scudder. Price 10 cents.

A method is described involving the use of recording turn meters and accelerometers and a sensitive altimeter, by means of which all of the physical quantities necessary for the complete determination of the flight path, motion, attitude, forces, and couples of a fully developed spin can be obtained in flight. Data are given for several spins of two training type aeroplanes which indicate that the accuracy of the results obtained with the method is satisfactory. The method was developed by the National Advisory Committee for Aeronautics at Langley Field as a part of a general study of the phenomenon of spinning. It is now being used in an investigation to determine how the spinning characteristics of several aeroplanes are affected by various changes in their inertia and geometric characteristics. A study is being made to extend the method to include measurements during the entry and recovery from a spin, as well as during the fully developed spin.

THE "DEUTSCHLANDFLUG, 1931"

By EDWIN P. A. HEINZE

Some of the Competitors at Staaken Aerodrome before the Start.

In last week's issue of "Flight" we gave briefly the results in the German National Competition "Deutschlandflug, 1931." This week we publish an article from our German Correspondent on the competition. Herr Heinze gives many details of the regulations and technical tests which should be studied carefully, as it is probable that those for next year's International Light Plane Competition will be based upon this year's regulations.

THE Aero Club of Germany carried out a national light plane contest from August 11 to 16. The regulations of this purely German event were in many important respects different from those used in the 1929 and 1930 international contests, and rather resembled those underlying the recent Circuit of Italy. There were two main points of difference. One was that the air tour, in which last year the speeds of the competing planes were artificially limited on purpose to prevent racing, was this year carried through as a race. The other was that the starting time of the various aeroplanes in the race was directly affected by the number of points each plane was able to obtain in the previously-held technical tests, in such a manner that the competitor with the lower number of points had to start after one having a higher number. This is really a reverse kind of handicap, in which the less efficient machine is placed at a disadvantage, being able only to make up for lost points and lost chances by a high turn of speed and good pilotage.

THE TECHNICAL TESTS

The technical and performance tests were somewhat simpler than those of last year, and comprised the following:—

Test.	Maximum points obtainable.
(a) Dismounting and refitting	6
(b) Manner of starting engine and time required	7
(c) Length of starting and landing stretch	10
(d) Lowest speed in the air	27
(e) Fuel consumption	20
(f) Equipment and comfort	30
Total	100

Eligible for the competition were the usual two classes of light planes, of which the first is allowed to weigh empty up to 460 kilograms (1,012 lb.), the second up to 322 kilograms (708 lb.), including all those parts which in any manner influence the allocation of points, such as cabin arrangement, slots, fire extinguishers, mooring fittings of all-metal planes, and similar things, but excluding tools, spare parts, parachutes, luggage, etc.

It is doubtless to be regarded as a characteristic development in modern aeroplane design that light planes are becoming heavier. That this was a particularly striking feature in this German competition appears surprising if

THE WINNER: Oskar Dinort and his passenger Freiherr von Houwald.

FLYING BROTHERS: Herr Wolf Hirth (left), who secured second place, discussing things with his brother, Hellmuth Hirth, the famous German pioneer pilot who designed the engine in Hirth's machine.

it is considered that hitherto German makers have excelled in the production of ultra-lightweight machines. Of nineteen competing planes, only a single one could be allocated to the small class. All others weighed in excess of 708 lb. This may partially be due to the Bayerische Flugzeugwerke having become bankrupt. It was this company that had built the light BFW planes, which were so successful in the European Circuits of 1929 and 1930. Had it still been working, it is probable that more machines of the ultra-lightweight class would have participated. But it is by no means certain, for the latest production of the company in this line of airplane was a machine of the heavier class, which actually started in the present event. Apart from these considerations, however, the present regulations considerably handicap the small machines, as high requirements relative to equipment and speed are made, which are not reconcilable with very light weight. In fact, if these regulations are going to be adhered to, it appears highly probable that the smaller of the two eligible classes of planes is doomed to disappear.

Of the planes competing in the German trial, fifteen were Klemms, of which eleven had four-cylinder Argus engines. Since last year's international trial, the power output of the Argus engines has been raised from 100 h.p. to 125 h.p., mainly by increasing engine speed, and many of the Klemms in this trial were fitted with the new engines. As, however, the planes had not been altered to suit the larger available power, the gain in speed was not considerable, and some of the competitors overstrained their engines. Three further Klemms had Siemens & Halske engines (SH13), which deliver approximately 90 h.p. There were two old Arado machines with Argus engines, and only one Junkers machine in the trial (Siemens engine). Theo Croneiss, managing director of the second largest German air transport company, the Deutsche Verkehrsflug A.-G., flew the new BFW machine already referred to. This plane, by the way, looked the finest and fittest of all machines entered for the trial, but, probably owing to the fact of Herr Croneiss being more accustomed to the handling of large transport planes, he lost heavily in the technical and performance tests, to make up for which losses he afterwards over-strained the Argus engine, which caused him to retire during the race.

All these machines belonged to the heavier category. The only one of the small class was an old Klemm, owned and piloted by Wolf Hirth. This machine was equipped with a new inverted four-cylinder air-cooled engine designed by Hellmuth Hirth, Wolf's brother, who is a well-known engineer and pioneer pilot. The engine is of 65 h.p., and has a number of very interesting features.

The first technical test was dismantling and re-erecting the machines, and was similarly conducted as that of last year. By far the fastest time was achieved by Croneiss with his new BFW, which he dismounted for transport and refitted for flight in exactly 1 min. 39.7 sec. This is probably a record. The BFW is provided with a patent wing lock mechanism with one lever beneath each wing root, admitting of two bolts being withdrawn at one pull, leaving the wing hanging on a single universal joint, around which it can then very easily be turned flat against the fuselage. This brought Croneiss five points, a number only reached also by Hagen with his Arado, who, however, actually required 2 min. 43.3 sec.

Also, the engine starting tests were similar to those of last year. Machines with engines that can only be started by turning the propeller were not allowed to take part in the competition at all. For the method of starting, and the starting device, up to four points were to be allocated, and for the time required to set engines going, three points. Barring the three planes fitted with Siemens & Halske engines, which were not provided with any kind of starting device—the others had starting handles—all competitors received three points for the starting method. Most pilots also succeeded in getting their engines running within 15 seconds, so they secured the maximum number of points. The starting test was in each case repeated five times, the first time with cold engine, and the award was made on the average time.

The equipment and comfort test brought Croneiss 16 points for his BFW, the highest number anyone secured out of a possible 30, which could be allocated as follows:

General comfort	5
Cabin for the whole crew	3
Visibility	4
Fire prevention fittings beyond those required by the regulations	2
Third comfortable seat	5
Possibility of adjusting stabiliser from pilot's seat	3
Possibility of adjusting stabiliser from the ground	1
Mooring fittings for all-metal planes	1
Good arrangement of instruments	2
Specially progressive features, such as slot ailerons, canard type wing or tailless arrangement	5

Next-best after Croneiss was Dudenhausen with his Junkers plane, for which he secured 11 points. Mainly on account of their cabin arrangements the two Arados each received 10 points, while most of the others received 5 to 9 points. Whereas in last year's event most of the German

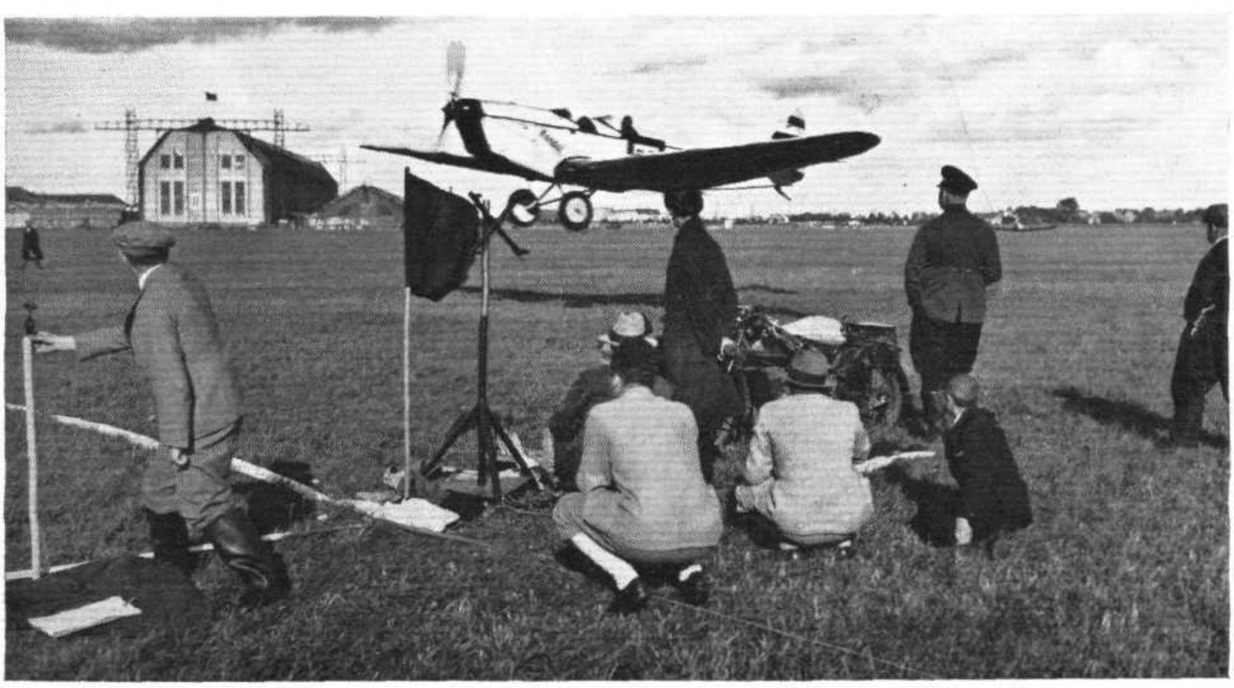
THIRD MAN HOME AGAIN: Adolph Kneip greeted on his arrival at Tempelhof upon his getting third place in the "Deutschlandflug."

competitors had attempted to secure some sort of protection against the weather in machines with open cockpits, generally by fitting sliding or folding hoods with cellon panes, this year practically no such arrangements were met with, probably on account of these impairing vision. Offermann's fatal accident last year was attributed to such a hood, through which he failed to make out the wires of a wireless station in which the machine became entangled. But Croneiss had sliding hoods of aluminium, which could be partially drawn over the cockpits, leaving only a small hole open for the head. This was done less for protection than to reduce resistance caused by the cockpit openings.

THE FOLDING AND "DOOR-WHEELING" TEST: Kneip's machine going through the "gate."

Then followed the tests requiring not only an efficient plane but in a higher measure even an efficient pilot. The first of these was the measuring of the take-off and landing distances. In succession each machine had to line up at near end of a marked track with engine idling. On a given signal the pilot started, and assistants along the course planted a flag on the spot where the wheels took off. The distance was then measured, and the mean speed of the wind in metres per second one metre above ground during the start was added to the result. As the speed of the wind was continually changing, the weather being very boisterous, even such good pilots as Poss, misjudged the right moment for pulling the machine into the air, and so the results obtained were more based on good luck than efficiency. For a distance of 30 metres, including the mean wind velocity, 5 points were to be awarded. A pilot requiring more than 90 metres received no points. Only three competitors were able to secure 2 points, four 1 point each, and the rest none at all. The alighting test was conducted in a similar manner. Only three pilots obtained 2 points and the same number 1 point. One repetition of the trial was allowed, but only half the number of points was in this case to be awarded. No one, however, took advantage of this. It will be noticed that in this test the obstruction, consisting of two masts with a line of flags between, over which last year competitors had to start and land, was this year dispensed with.

A novel feature in Germany was the test of the lowest speed in the air, for which up to 27 points could be allocated. As the weather was still boisterous this was a very difficult trial. The machines were required to fly horizontally at a height not exceeding 50 metres above ground over a marked course 50 metres broad and 1,000 metres long. The trip had to be repeated once in each direction, the velocity of the wind being deducted from the result. The maximum number of points was to be awarded to all machines, the average speed of which did not exceed 60 kilometres per hour (37.2 m.p.h.). For each kilometre per hour exceeding this speed, up to and including 73 kilometres per hour (45.5 m.p.h.) 1 point was to be deducted, and 2 points for each kilometre beyond this, up to 81. Higher speeds were not rated. In this trial also each machine had to carry an extra ballast of 50 kilograms (110 lb.) besides its crew of two, which had to be in the machine during all trials. The rating was effected on the basis of double the length of the course divided by the sum of the time required for the successive out and back flights. Two flights in each direction were allowed, of which the one with the most favourable result was rated. The machines were required to remain strictly within the boundaries of the course, and not to lose more than 30 metres in altitude, otherwise no points were to be awarded. A repetition of the test was possible, in which case only half the number of points could be secured. Some of the entrants with machines having



IN THE LANDING TEST: This year competitors did not have to land over an obstacle.

metal propellers had reset these for this trial, and went over the course with their machines literally hanging on the propellers. Nevertheless the results were not brilliant. The best man was Poss, who obtained 20 points. Then followed Dinort with 18 points, Weichelt with 17 points, Wolf Hirth with 16 points, and several with 15 points, while five competitors received no points at all despite repetition. Amongst these was Croneiss.

Then followed a fuel consumption test, for which 20 points could be awarded. The larger machines were to receive the maximum number of points if they did not require more than 8 kilograms (17.6 lb.) of fuel for a flight of 100 kilometres over a marked course. For every 0.6 kilogram (1.32 lb.) they required more one point less was allocated, while a consumption exceeding 20 kilograms (44 lb.) for the distance was not rated. The smaller category was to cover the distance with only 5 kilograms (11 lb.) of fuel, one point to be deducted from the maximum of 20 for every 0.5 kilogram (1.1 lb.) used in excess of this, the limit being 15 kilograms (33 lb.). The fuel was supplied by the organisers, and it was strictly prohibited to add any kind of ingredient or to employ other jets and choke tubes in the carburettors than those to be used in the race. Also the planes had to carry the extra ballast previously referred to. A remarkably large number of competitors was able to gain the maximum number of points, amongst them Poss, Dinort, Deffner, Dudenhausen and Beseler. No one received less than 14 points.

This completed the technical tests, which lasted from August 11 to 14, and the competitors emerged from these with the following number of marks out of the theoretically possible 100 points:

1st Category

Pilot	Machine	Engine	Points
Poss	Klemm	Argus	61
Dinort	,,	,,	56
Junghanns	,,	,,	50
Liesel Bach	,,	,,	48
Kneip	,,	,,	45
Schulze-Eckard	,,	,,	45
Weichelt	,,	,,	45
Deffner	,,	Siemens & Halske	45
Maier	,,	,,	44
Thomsen	,,	Argus	43
Croneiss	B.F.W.	,,	42
Beseler	Klemm	Siemens & Halske	40
Elli Beinhorn	,,	Argus	40
Siebel	,,	,,	38
Dudenhausen	Junkers	Siemens & Halske	37
Baumert	Klemm	Argus	36
Hagen	Arado	,,	35
Osterkamp	,,	,,	31

2nd Category

Pilot	Machine	Engine	Points
Wolf Hirth	Klemm	Hirth	51

THE AIR RACE

As already indicated, these results were used as a kind of handicap basis for the order of starting in the race. The latter took two days, and the machines started from the Staaken airport of Berlin on the following tour:

First Day.

Berlin—Travemünde (Baltic Coast)	136 miles.
Travemünde—Münster (Westfalia)	195.5 ,,
Münster—Duisburg	53.5 ,,
Duisburg—Stuttgart	217.0 ,,
	602 miles.

Second Day.

Stuttgart—Munich	123.5 miles.
Munich—Vienna	231.0 ,,
Vienna—Breslau	203.0 ,,
Breslau—Berlin—Tempelhof	180.5 ,,
	738 miles.

Total mileage: 1,340 miles.

ENGINE-STARTING TEST: Propeller-swinging was not permitted. Wolf Hirth's Hirth engine being started.

The competitors were required to remain exactly one hour at the first two stops before continuing flight. At Duisburg they had to stop for 15 minutes, and half an hour at Munich, Vienna and Breslau. At Stuttgart they stayed overnight. Originally the night stop was arranged to be at Munich, but on the first day the weather was so exceedingly bad that the race was stopped by the air police at Stuttgart, where most of the pilots already arrived in a very fatigued state.

As regards the handicaps, the machines with a lower number of points were to start later than those with higher numbers and, furthermore, the machines of the second class were to receive a certain start over those of the first. There were, therefore, two distinct handicaps, if so we may call them, to be considered. These handicaps were not only to be given the first day but also on the second, and were for this reason brought into relation with the distance to be covered each day.

The handicap in favour of the second category was based on a difference in maximum speed of 20 kilometres per hour between the two categories, it being assumed that the small machines could do 140 kilometres per hour and the large 160 km./h. The following formula was employed to establish the lead of the small planes:

$$\frac{\text{Length of day's route}}{\text{140 km.}} - \frac{\text{Length of day's route}}{\text{160 km.}} = \text{lead in hours}$$

The time by which the start of the larger machines with lesser points was to be retarded was calculated as follows:

FOURTH PLACE: Fraulein Liesel Bach being congratulated by the German Minister of Transport, Herr von Guerard.

$$\frac{\text{Length of day's route}}{160} \times \frac{(100 - \text{points obtained})}{100} = \text{hours.}$$

Each of the larger planes was, therefore, started so long after scratch time as calculated by this formula, minus the handicap for the small machines, the start retardation of which was calculated by the formula:

$$\frac{\text{Day's route}}{140} \times \frac{(100 - \text{points scored})}{100} = \text{in hours.}$$

For the large machines a minus of one point worked out to a retardation of practically four minutes on the first day's start. The starting order for the second day was similarly calculated, but the time gained or lost during flight by the individual competitors was added or deducted. This looks very complicated, but in fact the scheme worked exceedingly well, despite the fact that all the arrangements originally made for the night's stay at Munich were overturned in the last minute by the police stopping the race at Stuttgart. How great the differences in the starting times were will be seen from the list containing the initial starting times at Staaken airport in Berlin:

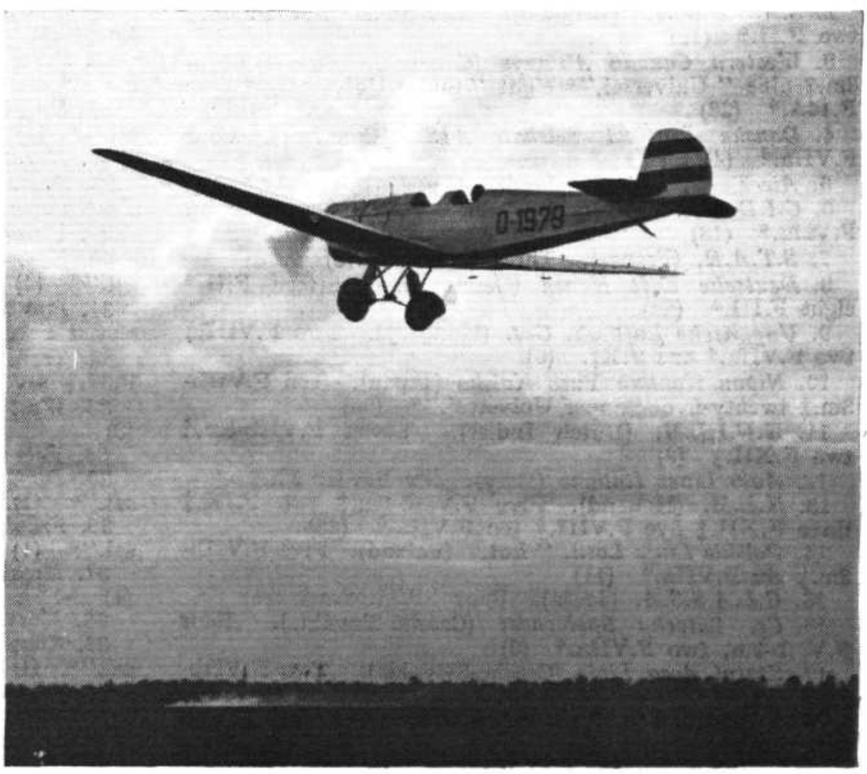
	A.M. h.	min.	sec.
Poss	4	30	00
Hirth*	4	41	30
Dinort	4	51	30
Junghanns	5	18	00
Liesel Bach	5	26	30
Kneip	5	40	00
Schulze-Eckardt	5	40	00
Weichelt	5	40	00
Deffner	5	40	00
Maier	5	44	00
Thomsen	5	48	30
Croneiss	5	53	00
Beseler	6	01	30
Elli Beinhorn	6	01	30
Siebel	6	10	30
Dudenhausen	6	15	00
Baumert	6	19	00
Hagen	6	23	30
Osterkamp	6	41	00

* Second category.

Doubtless much can be said against this form of handicap. If one wants to test the skill of the pilots, it should be different. If, on the other hand, one solely wants to test the efficiency of the machines, not only pilots of equal experience and skill should be entrusted with the machines, but also all possibilities of merely fortunate or unfortunate circumstances affecting the results should be avoided. With the present regulations neither the one nor the other nor both together is satisfactorily achieved. They are a compromise, with all the disadvantages inherent in such. But, as far as the handicapping goes, it did not appear a failure, for in the race the positions of the competitors constantly changed. Leading at the start by 11½ min. with a 125-h.p. plane against Wolf Hirth's similarly sized plane with only a 65-h.p. engine, it is clear Poss would not lose an inch unless engine failure or some other mishap overtook him. In this regard, the handicap of the small machines was too severe. By the time Poss had reached the first stage—Travemünde—only 136 miles from Berlin, he was more than 18 min. ahead of Hirth. At Münster, Dinort, who had overhauled Hirth and was 16 min. behind Poss, having caught up 5½ min. against him, caused Poss to open all out in the following stages. The weather now began to become exceedingly bad. Motorcars on the ground were seen slowly crawling along with their headlights on at midday to penetrate a thick fog. Poss, however, found his way very well, and was able to gain considerably on his rivals before he reached Stuttgart, where he landed 37 min. ahead of Dinort and 1 hr. 29 min. in advance of Hirth, while fourth man still was Junghanns, who had started 48 min. behind Poss and arrived 1 hr. 3 min. behind him. Croneiss in his BFW made a valiant effort and had gained seventh place by the time he reached Münster. But still he had lost 5 min. against Poss. Nineteen miles in front of Stuttgart his engine failed, however, and he was forced to land and retire. Already before reaching Münster Thomsen had made a forced landing and retired with a broken carburettor, while still earlier Hagen had to give up at Osnabrück. So only sixteen competitors were left at Stuttgart, where the order of arrival of the first machines was Poss, Dinort, Hirth, Junghanns, Weichelt and Liesel Bach. All of these competitors had lost considerably, partially up to three-quarters of an hour, to Poss. In the remainder of the field positions were constantly changing.

Early next morning the pilots were started anew under the new handicaps, but Poss had to retire as his engine would not start. The valves were burned. Now Dinort had the lead of 46 min. ahead of Hirth. Third man was Junghanns, 1 hr. 17 min. behind Dinort, and fourth Liesel Bach 1 hr. 49 min. behind. Owing to the handicap she started before Weichelt, although the latter had arrived before her previous day. Weichelt had to start 9 min. behind Fräulein Bach. The race was now becoming definitely exciting for the masses of the Berlin population that had turned out to the Tempelhof airport to witness the arrival of the competitors and for the spectators on the ports en route. The news service was excellently organised by the Aero Club of Germany, and loud speakers in the enclosures as well as score boards informed the visitors of the progress of the race.

Dinort arrived first at Tempelhof 1 hr. 16 min. in front of Wolf Hirth, who was second. Third was Kneip, who in the last stage succeeded in passing Liesel Bach. He was 1 hr. 40 min. behind Dinort, while Liesel Bach came in 6 min. later, followed after 11 min. by Weichelt and after 13 min. by Junghanns. Also, Siebel having retired at Stuttgart, where he had to return soon after his start, there were fourteen competitors left out of nineteen that had started, and all of these arrived at Berlin within closing time, all of them a considerably greater time behind the first man than they originally had been behind Poss when starting. Dinort's average speed in the race was 102.3 m.p.h. and Hirth's 93 m.p.h. Kneip, with the same type of machine and motor as Dinort, averaged 100 m.p.h., Liesel Bach, the fourth to arrive, averaged 97 m.p.h., while Weichelt's speed was 98½ m.p.h.



A NEW TYPE: The Messerschmitt M. 27 flown by Theo Croneiss.

Air Transport

THE POPULAR FOKKER

AN INTERNATIONAL JUNCTION: Schiphol, the airport of Amsterdam, is called at by Fokker machines of many international airlines. The above photograph shows in the foreground a K.L.M. Fokker F.VIII, next to it a Fokker F.III belonging to the German Luft Hansa, and a Fokker F.VIIa of the Danske Luftfartselskab. In the second row, from left to right; Fokker F.VIIb-3m Swissair, F.VIIb-3m Sabena (Belgium), F.VIIb-3m Ceskoslovenska Letecka Spolecnost (Czechoslovakia). In the background another Lufthansa F.III.

AIR transport statistics, which are published from time to time, mainly refer to miles flown and passengers, mail, and freight carried, etc., but information regarding types of aircraft used is seldom given. We think, therefore, that the following figures, compiled by the Fokker Co., of Amsterdam, indicating the numbers, and different types, of Fokker machines employed by the various air transport companies, should be of particular interest.

The figures, which we give below, refer to aircraft operated on regular air lines only, and do not include machines owned by private persons or companies for their own exclusive use. If the number of such machines is added to the total given, the total number of Fokker commercial aircraft in use all over the world would exceed 300. The companies operating Fokkers—the total number of all types being given in brackets—are as follow:—

1. *Australian National Airways* (Australia). Five F.VIIb-3m.‡ (5)
2. *S.A.B.E.N.A.* (Belgium). Seventeen F.VIIb-3m,‡ two F.II.* (19)
3. *Western Canada Airways* (Canada). One F.VIIb-3m,‡ nine "Universal,"* eight "Super Universal,"* four F.14A.* (22)
4. *Danske Luftfast Selskab A/S.* (Denmark). Four F.VIIa.* (4)
5. *Air Taxis, Ltd.* (England). One "Universal."* (1)
6. *C.I.D.N.A.* (France). Six F.VIIb-3m,‡ seven F.VIIa.* (13)
7. *S.T.A.R.* (France). Three F.VIIa.* (3)
8. *Deutsche Luft Hansa* (Germany). Fourteen F.II,* eight F.III.* (22)
9. *Ungarische Luft vk. Ges.* (Hungary). Two F.VIII,‡ two F.VIIa,* one F.XI. (5)
10. *Nipon Kohkuk Yuso Kaisha* (Japan). Ten F.VIIb-3m,‡ twenty-five "Super Universal."* (35)
11. *K.N.I.L.M.* (Dutch Indies). Seven F.VIIb-3m,‡ two F.XII.‡ (9)
12. *Avio Linee Italiane* (Italy). Six F.VIIb-3m.‡ (6)
13. *K.L.M.* (Holland). Five F.VIIb-3m,‡ two F.IX,‡ three F.XII,‡ five F.VIII,† ten F.VIIa.* (25)
14. *Polskie Linje Lotn. "Lot."* (Poland). Five F.VIIb-3m,‡ six F.VIIa.* (11)
15. *C.L.A.S.S.A.* (Spain). Four F.VIIb-3m.‡ (4)
16. *Cs. Letecka Spolecnost* (Czecho-Slovakia). Four F.VIIb-3m, two F.VIIa.* (6)
17. *Statni Aero Linie* (Czecho-Slovakia). Two F.VIIb-3m.‡ (2)
18. *Flugplatz Gen. "Alpar"* (Switzerland). One F.XI.* (1)
19. *A.T.A.* (Italy). Two F.III.* (2)
20. *Air Orient* (France). Four F.VIIb-3m.‡ (4)
21. *Imperial Airways* (England). Two F.VIIb-3m.‡ (2)
22. *Swissair* (Switzerland). Eight F.VIIb-3m,‡ one F.VIIa.* (9)
23. *McRobertson & Miller Av. Co.* (Australia). One "Super Universal."* (1)
24. *Queensland Air Nav. Co.* (Australia). One F.VIIb-3m.‡ (1)
25. *Parer Messenger Airways* (New Guinea). One F.III,* one F.VIIa.* (2)
26. *Union Airways* (South Africa). One "Super Universal."* (1)
27. *North Aerial Min. Expl.* (Canada). Two F.III.* (2)
28. *South Air Fast Express* (U.S.A.). Three F.10A,‡ six "Super Universal."* (9)
29. *Universal Air Lines* (U.S.A.). Nine F.10A.‡ (9)
30. *Nat. Park Airways* (U.S.A.). Four "Super Universal."* (4)
31. *Pan American Airways* (U.S.A.). Two F.VIIb-3m,‡ eleven F.10A.‡ (13)
32. *Transcontinental & Western Air* (U.S.A.). Two F.32,§ seventeen F.10A,‡ three F.14A.* (22)
33. *West Coast Air Transport* (U.S.A.). Three F.10A.‡ (3)
34. *Tela Rail Road* (Honduras). One "Universal."* (1)
35. *Dixie Flying Service* (U.S.A.). One "Super Universal."* (1)
36. *Frank Martz Coach Co.* (U.S.A.). One "Universal."* (1)
37. *Massanutten Airways* (U.S.A.). One "Universal."* (1)
38. *Moscow Air Transport.* One "Universal."* (1)
39. *Canadian Airways* (Canada). One "Super Universal."* (1)

A total of 283 machines, made up of the following types: * Single-engined, 135 (16 F.11, 13 F.III, 36 F.VIIa, 2 F.XI, 7 F.14A, 14 "Universal," 47 "Super Universal." † Two engined, 7 (F.VIII). ‡ Three-engined, 139 (89 F.VIIb-3m, 2 F.IX, 43 F.10A, 5 F.XII. § Four-engined, 2 (F.32).

Russia's Giant Air Liner

THE Soviet aeroplane works have constructed an all-metal aeroplane with five engines having a total power of 2,400 h.p., and with accommodation for 41 passengers.

THE MEANING OF AN IMPERIAL AIR ROUTE

"A First Experience" of air-travel, as set forth in the following letter in *The Times*, should carry weight with all who are inclined to question the future of an Imperial Air Service.—

Sir,—I have just returned by air from Central Africa and feel that I ought to help to bring to the notice of my fellow countrymen and countrywomen an extraordinary development in travel of which, I gather, most of them are ignorant. It was one of the most delightful trips I have taken, and the only part I did not like was when I had to get out of the 'plane at Croydon, and to realise that the journey was over.

I had been spending the winter with friends in Kenya and Uganda. I had gone out by sea—a voyage of nearly a month, and then three days and nights by train from Mombassa. A long voyage like that, through the Bay of Biscay, the choppy Mediterranean, the heat of the Canal and the Red Sea, and a long uninteresting voyage down the East Coast of Africa, had not proved very attractive, and when I heard that I could fly home in seven days, the idea appealed to me enormously. I had never flown at all before, and my friends thought it rather a risk, but the whole trip proved to be a sheer delight and, although I had had to defer my flight three times on account of rather serious illness and was not perfectly recovered when I started, I arrived in England a well woman.

My friends motored me from Entebbe to Port Bell (on Lake Victoria Nyanza on the Equator) in the early morning, and a launch took me to the flying boat. To rise from the lake in a flying boat was the most agreeable sensation, and it was a unique and marvellous experience, too, to fly across Uganda and come down in Lake Albert, where we picked up passengers from the Belgian Congo, and then on to Juba. On our way the flying boat flew very low twice—once to see a herd of elephants, and another time giraffes: the elephants, of course, were terrified, and stampeded with their ears sticking right out.

Even at Juba we had most comfortable rooms, hot baths, and good dinners. Most mornings we started early, so as to arrive at our destination in time to see the wonderful sights which the route offers, but, as we found we could sleep quite easily in the aeroplane, it was not too tiring. I was travelling at the hottest time of the year across the sudd and the Sudan, but this part of the journey only lasted two days and the heat was far from overpowering while flying. One of the days it was rather bumpy, so, to avoid discomfort, the pilot took us high up (9,000 ft.), and there, although it was smooth travelling, we were glad to put on big coats.

At Khartoum we changed over to a land aeroplane, and there and at Wadi Halfa we had time to saunter along the banks of the Nile. At Alexandria we changed over again to a flying-boat and then crossed the Mediterranean. We spent a most delightful day, arriving in Crete in time for lunch, which was served on board a launch amid wonderful surroundings. We arrived at Athens at tea time, and there, again, we had tea on a motor-yacht. Corfu was reached about 5 o'clock in the afternoon, and we went for a lovely motor trip up the mountain, returning to the hotel about 10 o'clock, where we had an excellent dinner in the garden.

All this travelling might have been tiring if we had had to do anything for ourselves, but everything was arranged and with every comfort, too. We stayed at the best hotels *en route*, and at delightful rest houses in the desert; we had excellent food everywhere, and, where necessary, luncheon baskets were provided on our departure by the hotels. To a woman travelling alone it was a real joy not to have to arrange about rooms or meals in the hotels, nor to have to tackle my own luggage and struggle with it through Customs. Wherever we landed cars were waiting to take us to the hotels with our baggage, and in Egypt particularly, where travelling is not too easy nowadays, it was a delight to have everything done for one. I owe it to the pilots and every member of the staff of Imperial Airways to acknowledge their invariable courtesy and the constant attention paid to our comfort, and to Imperial Airways itself for the provision of quite luxurious accommodation in even the most remote stopping places.

Finally, the whole trip cost me no more than going via the Red Sea by boat. Of course, the boat keeps you for 28 days instead of seven, but, unless you are a lover of the sea, who wants to be kept all that time in a boat—especially in the Red Sea?—I am, etc.,

Winifred Vergette.

9, Carlyle Mansions, The Mall,
Kensington, W.8.

Aeropostale Services in S. America

The Compagnie Generale Aeropostale inform us that reports published in certain Continental papers to the effect that the air mail service from Buenos Aires to Santiago du Chile was suspended are incorrect. This line is still in operation, and will continue to be run as in the past, being the continuation of the weekly air mail service from Europe to South America by the Compagnie Generale Aeropostale. They also inform us that the air line, Buenos Aires—Patagonia, which had been temporarily suspended, has now been re-opened with the financial participation of the Argentine Government.

MODELS

Some Good Flying by T.M.A.C.

Various Wings of The Model Aircraft Club (T.M.A.C.) put up some excellent flying during the last few days, as may be gathered from the following reports:—

T.M.A.C. Grand Rally.—The meeting at Hackney Marsh on Saturday, August 22, was a most enjoyable occasion, good weather and good flying being the order of the day. Representatives from H.Q., and Wings 2, 3, 4 and 12, all put up an excellent show.

A Duration and Reliability Contest was held, competitors making three H.L. flights each, and the average of the three being taken. Mr. Andrews, of 10th Squadron, 4th Wing, won 1st prize with his "Balsa Ditherer," his best flight being 81 sec., and his average 68. A prize for heavier types went to Mr. Wood, of 12th Squadron, 4th Wing. His low-wing Kingfisher averaged 51, its best flight being 71. Miss Briggs, Capt. Whippey and Messrs. J. Beard, Bennett, Gates, D. Beard and A. E. Jones also put up good performances.

Flights were also made by sundry Kittens and Kingfishers, a Kinglet, a Snipe from 2nd Wing, Mr. Bennett's scale Wapiti, Mr. Linfoot's small High-wing, and Mr. Batchelor's biplane "Bellona." Mr. Young obtained several short flights with Mr. Knight's Pterodactyl.

1st Wing.—On Sunday, August 23, Mr. Trevithick put up some remarkable performances, which were timed by A. E. Jones and W. A. Brett, with his compressed-air model. From 12.45 p.m. to 5.30 p.m. he made 14 consecutive flights, as follow:—1st, 52.5 sec.; 2nd, 53.5 sec.; 3rd, 65 sec.; 4th, 50 sec.; 5th, 54 sec.; 6th, 53 sec.; 7th, 50.5 sec.; 8th, 58.5 sec.; 9th, 40 sec.; 10th, 40 sec.; 11th, 60 sec.; 12th, 57 sec.; 13th, 60.5 sec.; 14th, 49 sec. This makes an average of just over 53 sec. per flight.

10th Wing.—The best week-end of good flying weather was made the most of by members of the 10th Wing. Messrs. Gibson and White were making average flights of 60-80 sec. A. Gordon and A. T. Willis were flying solely for altitude and some extremely high flights were seen, one estimate being 600 ft. The best timed flight of the day was made by Master A. M. Willis, a duration of 8 min. 7 2-5 sec. being recorded by the club's stop-watch. Messrs. Whippey and Cox were also making good flights.

17th Wing, Manchester.—The holiday season did not prevent members from giving a good display of model flying at Mauldeth Road on August 23. The chief feature was the half-size model of Mr. Sheldrake's "Famosis," constructed by Master Hodson, under the guidance of the builder of the larger model. Both machines were present, and the performance of the smaller one was truly remarkable. This is the first occasion on which we have had the opportunity of witnessing the flight of a model of a model!

Messrs. Pearce *avec* "Nimbus," Thompson "Crusading" and Robinson with a new and nameless model, all helped to carry on the good work.

If there are any readers in the Nelson district who are interested in model aviation they would do well to get into touch with Mr. Sutton, whose address is 33, South Field Street, Nelson, Lancs.

Airisms from the Four Winds

The Fairey (Napier) Long-Distance Monoplane

SOME trial flights have been made with the Fairey (Napier) long-distance monoplane. It is proposed that before an attempt is made to fly non-stop to the Cape, a preliminary flight should be made to Khartum about the third week in September, a distance of nearly 4,000 miles. Sqd. Ldr. O. R. Gayford and Flt. Lt. D. L. G. Bett have been chosen as pilots in charge of this machine on its long-distance flights.

Sir Alan Cobham

SIR ALAN COBHAM, who has just completed a survey flight in Central Africa on the Short "Valetta" seaplane, arrived at Aboukir on August 20.

Miss Amy Johnson Flying Home

MISS AMY JOHNSON left Tokio in her "Puss Moth" on August 24 on her return flight to England. Owing to bad weather over Korea, however, she had to return to Osaka.

The Lindberghs Reach Japan

COL. AND MRS. LINDBERGH have experienced several delays on the last section of their flight from New York to Tokio in their Lockheed "Sirrus" mono-seaplane. Having, last week, eventually reached Petropavlovsk, they once again met trouble when flying from the latter place to Nemuro (Japan) on August 19. Dense fog compelled them to alight off the uninhabited island of Ketoijima, in the Kuriles, and here engine trouble developed. The machine was later towed to Muroton Bay, where repairs were carried out, and on August 22 they proceeded on their way. Fog caused another forced descent at Iturup Is., but Nemuro was reached at last on August 23.

A German South Atlantic Flight

ON August 22 two German pilots, Willy Rody and Christian Johannsen, left Tempelhof aerodrome, Berlin, on an east-west Atlantic flight to Brazil, via Lisbon. They are flying a Junkers W.33 monoplane, and are accompanied by a Portuguese mechanic. They arrived at Lisbon on August 24.

Do.X Again

THE German flying boat, Do.X, which flew from Germany to Brazil a short while back, is now making a flight northwards to New York. She arrived at Para on August 8, at Port of Spain, Trinidad, on August 19, at San Juan on August 21, and at Miami, from Cuba, on August 22.

Fraulein von Etzdorf's Flight to Japan

FRAULEIN MARGA VON ETZDORF, flying a Junkers "Junior" (Armstrong-Siddeley "Genet"), flew from Berlin to Moscow on August 18 on the first stage of a flight to Tokio. Next day she went on to Kazan, and reached Kurgan (Siberia) on August 20, and Movosibirsk on August 21. She arrived at Irtutsk on August 23. Fraulein Etzdorf learnt to fly in 1927, and subsequently did much stunt flying at various meetings, and also accomplished a flight from Berlin to the Canary Islands.

A Gold Coast Venture

A JUNKERS seaplane, stated to belong to Capt. E. Seton Cotterill, of the British Aero Development Co., and piloted by Fl.-Lt. Burbidge (?), left Cowes (via Southampton for Customs) on August 18 for Lagos. Also on board were a mechanic and Mr. J. I. Cowan, who is to report on the possibilities of an air service between Gibraltar and Morocco. It is also stated that it is proposed to operate an air service along the Gold Coast and coast of Nigeria

The "Akron's" Commander

COMMANDER CHARLES ROSENDAHL, who for some time has been the commander of the United States airship *Los Angeles*, has been officially appointed commander of the new Navy airship, the *Akron*, which was recently christened by Mrs. Hoover.

Amundsen's Plane? (The Answer is in the Negative)

THE latest Arctic mystery, that of the unknown aeroplane which was discovered on a snapshot taken by the Russian scientist, Professor Moltschanoff, while the airship *Graf Zeppelin* was cruising over the uncharted wastes of Nova Zembla, has been solved, writes the Berlin Correspondent of *The Times*. The Professor, it seems, having taken a photograph of the Soviet flying-boat "N.S.," stationed at the Dickson Bay wireless station on the northern coast of Siberia, forgot to wind the film before taking his next picture. The double exposure produced the picture which has caused so much excitement and might have led to a special expedition or to an endless scientific controversy but for the success of a photographic expert in detecting the mistake.

Death of M. Maurice Clement-Bayard

THE death was announced in Paris on August 19 of M. Maurice Clement-Bayard, who was accidentally shot dead while examining a gun. M. Clement-Bayard was one of the early airship pioneers, and constructed several successful non-rigid airships bearing his name.

Italy's Diplomatic "Air Mail"

IT is reported that the Italian Foreign Office has decided to send its diplomatic bags to the principal European capitals by aeroplane. It is hoped that the use of aeroplanes will not only hasten written communications hitherto entrusted to couriers but may also "supersede largely and at less cost the sending of official telegrams."

Roumania's Flying Prince

PRINCE NICHOLAS left Roumania on August 20 by air for Poland, where he is going to visit the principal military and civilian centres of aviation. The Prince piloted the Roumanian-built S E T aeroplane himself.

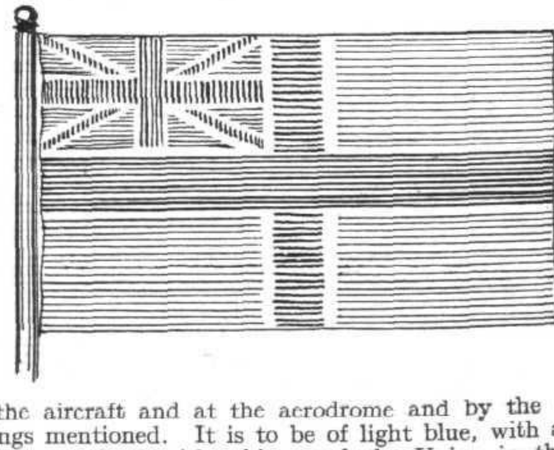
"A Flutter in St. James's"

HUMAN interest in airships as widely recorded takes various well-known forms. By way of contrast, the following "bird's-eye" view as set forth in a correspondent's letter to the Press gives pause for thought:—

"What Mr. A. A. Milne thought about the cormorant (which recently settled on the cross of St. Paul's) was nothing to what the wild-fowl and other birds in St. James's Park thought about the *Zeppelin*. The pigeons lost their heads and scattered wildly; the sparrows kept theirs, formed mass, and fled into the bushes; the white-faced duck whistled as he never whistled before; some of the geese actually flew tree high, to their own obvious surprise; and every gander, goose, gosling, drake, duck, and duckling, who felt (as did the large majority) that flying only made the matter worse, swam or scuttled to the Pelicans' Rock, where within three minutes of the *Zeppelin's* first appearance the whole population (except the pelicans themselves) was assembled. Why the Pelicans' Rock should be regarded as "home" is not very obvious. And the things they all said! As a lady on the bank remarked: "Well, I call it a shime."

The "Flight Ensign"

AN Order in Council establishing a Civil Air Ensign appeared in the *London Gazette* of August 25. The ensign is to be "a distinguishing ensign which may be flown by British aircraft registered in the United Kingdom; and which also may be flown at aerodromes situated in the United Kingdom which are licensed under the Air Navigation Act, 1920; and which also may be flown by air transport undertakings, which own such aircraft as aforesaid, on, or in proximity to, buildings used by such undertakings for the purposes of air transport." The ensign is to be recognised as the proper national colours to be flown



by the aircraft and at the aerodrome and by the undertakings mentioned. It is to be of light blue, with a dark blue cross edged with white, and the Union in the first quarter.

THE ROYAL AIR FORCE

London Gazette, August 18, 1931

General Duties Branch

J. G. Cardale is granted a short service commn. as Pilot Officer on probation with effect from and with seny. of July 10; Capt. R. M. Giddy, R.M., is re-attached to R.A.F. as a Flying Officer with effect from June 27, and with seny. of June 16, 1924. The follg. Pilot Officers on probation are confirmed in rank (July 19):—R. Hanson, H. J. L. Hawkins, A. H. Hole, T. A. Jefferson, A. F. McKenna, F. G. Mason, C. L. Monckton, M. A. Payn, H. N. G. Ramsbottom-Isherwood, I. G. Ross, C. P. Villiers. The follg. Pilot Officers are promoted to rank of Flying Officer (June 14):—A. Earle, E. F. J. L'Estrange.

Flight Lt. (acting Squadron Leader) W. Elliott, D.F.C., relinquishes the acting rank of Squadron Leader on ceasing to be employed as British Liaison Officer, Beirut (July 11); Flying Officer H. J. Soper is placed on retired list (Aug. 18); the short service commn. of Pilot Officer on probation C. Cheshire (Sec. Lt., A.I.R.O.) is terminated on cessation of duty (April 1), (substituted for *Gazette*, May 5).

Stores Branch

Flying Officer W. A. G. Goldsworthy is placed on retired list at his own request (Aug. 6).

Medical Branch

Flight Lt. E. A. Rice, M.B., B.Ch., is transferred to Reserve, Class Dii. (Aug. 16).

Assistant Provost Marshal

Captain C. R. Richdale (I.A., retd.), is granted a permanent commn. as Assistant Provost Marshal and Deputy Chief of Air Force Police in rank of Flying Officer on probation (Hon. Flight Lt.), with effect from and with seny. of Aug. 10.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

W. D. T. Gairdner is granted a commn. in Class AA(i) as Pilot Officer on probation (July 10); Pilot Officer on probation J. M. D. Ker is confirmed in rank (Aug. 12); Flight Lt. B. C. Rice, M.C., is promoted to rank of Squadron Leader (Aug. 19). The follg. Flying Officers are promoted to rank of Flight Lieut. (Aug. 12):—P. Phillips D.F.C., J. W. Thomson, A. G. Loton, W. C. Venmore, R. N. Riddell, R. H. Holmes, J. H. Barringer, R. C. Whitle, E. A. T. Murray, C. E. Eckersley-Maslin, H. C. Johnson, W. J. Pickard, C. S. John.

The follg. Flying Officers are transferred from Class A to Class C:—A. M. Alexander, A.F.C. (May 29); J. R. Cox (May 22); F. W. Field (Aug. 5). The commns. of the follg. Pilot Officers on probation are terminated on cessation of duty:—F. P. B. Sanderson (July 24); J. B. W. Sherlock (July 24); W. H. Curtis (July 24); H. C. Beaumont (July 25).

Erratum

In the *Gazette* of July 21 (Flight, July 31, 1931, page 775).—For G. P. E. Howard read G. J. E. Howard.

SPECIAL RESERVE

General Duties Branch

The follg. are granted commns. as Pilot Officers on probation:—L. M. Few (July 24); T. R. Leatherdale (July 25).

AUXILIARY AIR FORCE

No. 600 (City of London) (Bomber) Squadron.—General Duties Branch.—Pilot Officer W. H. Wetton is promoted to rank of Flying Officer (Oct. 31, 1930).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch.

Group Captains.—J. R. W. Smyth-Pigott, D.S.O., to Station H.Q., Worthy Down, to command, 7.8.31. A. C. Winter, O.B.E., R.A.F. Reception Depot, West Drayton, to command, 3.8.31. F. L. Robinson, D.S.O., M.C., D.F.C., to R.A.F. Depot, Uxbridge, pending taking over command, 1.8.31. C. H. K. Edmonds, D.S.O., O.B.E., to No. 21 Group H.Q., West Drayton, to Command, 7.8.31. O. T. Boyd, O.B.E., M.C., A.F.C., to H.Q., Aden Command, pending taking over command, 7.8.31.

Wing Commanders.—T. L. Leigh-Mallory, D.S.O. to Air Ministry, on appointment as Deputy Director of Staff Duties, 7.8.31. E. O. Grenfell, M.C., D.F.C., A.F.C., to R.A.F. Base, Gosport, for administrative duties, 3.8.31. L. L. Maclean, to No. 23 Group H.Q., Grantham, for Engineer Staff Duties, 8.9.31.

Squadron Leaders.—B. E. Harrison, A.F.C., to Marine Aircraft Experimental Estabt., Felixstowe, 27.7.31. F. R. Alford, M.C., to H.M.S. *Hermes*, China, 7.8.31.

Flight Lieutenants.—R. A. P. Roberts, to No. 5 Flying Training School, Sealand, 5.8.31. J. D'A. Keary, to R.A.F. Training Base, Leuchars, 5.8.31. J. G. D. Armour, to Special Duty List, on appointment as Air Equerry to H.R.H. The Prince of Wales, 4.8.31. K. E. Ward, to No. 10 Sqdn., Boscombe Down, 7.8.31. J. T. Paine, to No. 111 Sqdn., Hornchurch, 7.8.31. J. H. Powle, to Marine Aircraft Experimental Estabt., Felixstowe, 5.8.31. G. E. Wilson, to No. 56 Sqdn., North Weald, 4.8.31. C. E. H. Allen, D.F.C., to Experimental Section, Royal Aircraft Estabt., S. Farnborough, 4.8.31. P. S. Blockey and R. Costa, both to Cambridge University Air Sqdn., 7.7.31. L. C. Barling, to No. 24 Sqdn., Northolt, 1.8.31. J. C. Belford, to No. 45 Sqdn., Helwan, Egypt, 27.7.31. G. B. Beardsworth and F. S. O'Hanlon, to R.A.F. Base, Gosport, 4.7.31.

Flying Officers.—J. C. Harcombe, A. F. C. Booth, K. A. K. MacEwen, G. F. W. Heycock, all to the R.A.F. College, Cranwell, 5.8.31. J. A. Simpson, A. F. Powell, A. J. Tunnard, A. E. V. Mathias, G. R. Montgomery, all to No. 5 Flying Training School, Sealand, 5.8.31. E. L. J. Rowe, to R.A.F. Training Base, Leuchars, 5.8.31. V. R. Moon, K. D. Knocker, C. B. Hughes, all to No. 3 Flying Training School, Grantham, 5.8.31. P. R. May, to No. 2 Flying Training School, Digby, 5.8.31. H. G. Wheeler, to School of Army Co-operation, Old Sarum, 1.8.31. G. M. Buxton and W. G. Cheshire, both to Cambridge University Air Sqdn., 7.7.31. N. A. Pearce, to Electrical and Wireless School, Cranwell, 5.8.31. G. P. Marvin, to Armament and Gunnery School, Eastchurch, 5.8.31. W. C. Cooper, to Cambridge University Air Sqdn., 30.7.31. D. A. Messiter, to No. 41 Sqdn., Northolt, 12.6.31.

Pilot Officers.—A. H. Button, to No. 5 Flying Training School, Sealand, 5.8.31. K. S. Brake, D. J. T. Haynes, J. R. Mutch, T. C. Dickens, F. D. Biggs, W. G. H. Ewing, G. F. Simond, E. C. T. Edwards, I. McL. Cameron, J. F. X. McKenna, V. B. J. Jackson, C. McK. Grierson, A. P. F. M. Berkeley, W. D. J. Michie, M. V. Delap, J. E. M. Bainbridge, S. O. Bufton, V. S. Bowling, E. D. Elliott, A. F. Britton, O. I. Gilson, H. D. McGregor, W. H. Jones, T. W. G. Eady, C. V. Howes, R. C. Jordan, G. K. Tulloch, H. E. Dicken, E. Coleman, D. F. M., E. C. W. S. Smith, all to Home Aircraft Depot, Henlow, 5.8.31. D. W. Morrish, to No. 3 Flying Training School, Grantham, 2.7.31. A. H. Hole, to No. 14 Sqdn., Amman, Palestine, 25.7.31. B. W. E. R. Bonsey, to No. 19 Sqdn., Duxford, 29.7.31.

Stores Branch.

Flight Lieutenant.—L. Smith, to Station H.Q., Netheraven, 5.8.31.

Flying Officers.—L. Horwood, M.C., to No. 501 Sqdn., Bristol, 8.8.31. L. H. Anness, A.F.C., to Station H.Q., North Weald, 3.8.31. H. E. Young, to No. 14 Sqdn., Amman, Palestine, 25.7.31.

Pilot Officers.—J. R. Fraser to Station H.Q., Worthy Down, 3.8.31. J. E. Shrimpton, to Station H.Q., Tangmere, 3.8.31. H. A. Sudbury, to Station H.Q., Manston, 3.8.31. E. G. Moore, to R.A.F. Base, Calshot, 3.8.31.

Medical Branch.

Wing Commanders.—A. Grant, M.B.E., to No. 1 Air Defence Group, pending posting as Principal Medical Officer, 29.8.31. R. S. Overton, to R.A.F. Depot, Uxbridge, for duty as Senior Medical Officer and Commanding Officer, R.A.F. Officers' Hospital, 24.8.31.

Flight Lieutenants.—P. H. Perkins, to Medical Training Depot, Halton, 27.8.31. J. Hutchieson, to Central Medical Estabt., 26.8.31.

Assistant Provost Marshal.

Flying Officer.—C. R. Richdale, to H.Q., R.A.F., Halton on appointment to a permanent commn. (on probation) as Assistant Provost Marshal and Deputy Chief of Air Force Police, 10.8.31.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—

Promotions.

Lieuts.—F. G. Wynne (Flying Officer, R.A.F.), J. F. M. Robertson (Flying Officer, R.A.F.), to rank of Lieut-Commr. (seny. Aug. 15).

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Air Manœuvres Abroad

The Italian Royal Air Force and the French Army Flying Corps both started extensive manœuvres on August 26. The Italian campaign will be held in northern Italy and will entail flying over the Apennines. The French exercises will test the air defence of the eastern frontier round Nancy.

The International Air Guide

Owing to a mistake on the part of the printers, a footnote to the review of the newly-issued *International Air Guide*, published in Flight last week, was omitted. This was to the effect that copies of *The International Air Guide* may be obtained from the offices of Flight, price 36s. 6d., post free.

Carrying Logs by Aeroplane

A new use has been found for aeroplanes, which are at present being extensively employed by mining prospectors in Northern Ontario and elsewhere in the far north of Canada. Having recently penetrated into a region where there are no trees of any size, a well-known Ontario prospector was recently faced with the problem of obtaining the necessary timber to hold up the sides of a 16-foot deep trench, which he was digging on a mining property in the sub-Arctic. He decided to cut the timber on the shores of a lake many miles away. Then, by carefully loading it in suitable quantities on an aeroplane equipped with floats, he succeeded ultimately in conveying all he required to his mine.

Marconi Rotating Beacon Transmitters

In the article published last week on the subject of Marconi Rotating Beacon Wireless Transmitters, the statement was made that the stations at Orfordness, Gosport, and Farnborough had been erected by the Marconi Company. We have been asked to state that this is incorrect, and that these stations were in fact erected by the Air Ministry. The mistake was entirely ours, and was due to a faulty interpretation of a sentence in the material sent us by the Marconi Company.

A Change of Business

Mr. S. J. Gilbert has now severed his connection with Selfridge's Aviation Department, and is starting in business for himself, operating from 22, Normandy Avenue, Barnet, Hertfordshire. He is already in a position to arrange very attractive rates for both the hire-purchase and insurance of aircraft and cars, and would be very glad to hear from any of his old friends who are interested.

AIRCRAFT COMPANIES' STOCKS AND SHARES

THE crisis in the political situation, continued uncertainty regarding the measures likely to be adopted to cope with the financial position, and general holiday influences, have combined to restrict business in the industrial section of the Stock Exchange to a very low ebb. Under the circumstances, it is hardly surprising that the general tendency has been for prices to move against holders. Market men report, however, that a firm undertone remains, and that provided the recommendations of the new Government meet with general approval, quotations may be marked up substantially. The surrounding uncertainty of market conditions has naturally adversely influenced the shares of aircraft and allied companies, but they have shown no very heavy declines. Chief interest has, perhaps, centred on Imperial Airways, whose annual report is expected by the market towards the end of September. At the time of writing the price of the shares has gone back to 13s., but there is reported to have been very little selling. The general belief is that the dividend will be retained at 5 per cent. On this basis the yield at the present time is nearly 8 per cent. De Havilland have gone back to 16s. 9d. and in this case the yield is also the largest for some time past. Fairey Aviation were well maintained on balance; the debentures have changed hands and have kept their price, a helpful influence being the payment of the half-yearly interest. These debentures seem to be snapped up quickly whenever they become available on the market. There is a cumulative sinking fund of 7 per cent. per annum, and the company has the right to purchase at or below 105 plus accrued interest, or by drawings at 105. The articles provide that no dividend in excess of 20 per cent. can be declared whilst there is any of the stock outstanding. The further decline in D. Napier shares is due probably to continued market talk of a lower interim dividend, but at 6s. these shares, which have a nominal value of 5s., do not appear overvalued, at least on probable average results over the next few years. If, as is hoped in some quarters, the interim is maintained, there would appear to be scope for a rise in the price. National Flying Services have changed hands around 4½d. The market is not, of course, expecting a dividend for the past year. Handley-Page participating preference continued in good demand and the price has improved, possibly on the prospect of a larger dividend on these shares for the current year. There has been a sharp fall in Joseph Lucas, following market talk of a possible "cut" in the annual distribution to 20 per cent. This seems, however, to have now been more than discounted in the price of the shares. Triplex Safety Glass remain well over par despite a fair amount of selling; hopes of a modest increase in the dividend are still current in some quarters. Market men attribute the improvement in Vickers and several other leading "iron, coal and steel shares" to buying on possibilities of a tariff. Petters issues have moved against holders.

Name.	Class.	Nominal Amount of Share.	Last Annual Dividend.	Current Week's Quotation.
			%	
Anglo-American Oil	Deb.	Stk.	5½	101
Armstrong Siddeley Develop.	Cum. Pref.	£1	6½	14/4½
Birmingham Aluminium Castg.	Ord.	£1	7½	18/–
Booth (James), 1915	Ord.	£1	15	38/6
Do. do.	Cum. Pref.	£1	7	20/6
British Aluminium	Ord.	£1	10	25/7½
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British Oxygen	Ord.	£1	8B	15/–
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British Piston Ring	Ord.	£1	22½	28/8
British Thomson-Houston	Cum. Pref.	£1	7	21/6
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En-Tout-Cas (Syston)	Def. Ord.	1/–	Nil	1/–
Do. do.	Ptg. Pfd. Ord.	5/–	8	3/1½
Fairey Aviation	Ord.	10/–	7*	13/3
Do. do.	1st. Mt. Deb.	Stk.	8	107½
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Fox (Samuel)	Mt. Ptual. Deb.	Stk.	5	71½
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